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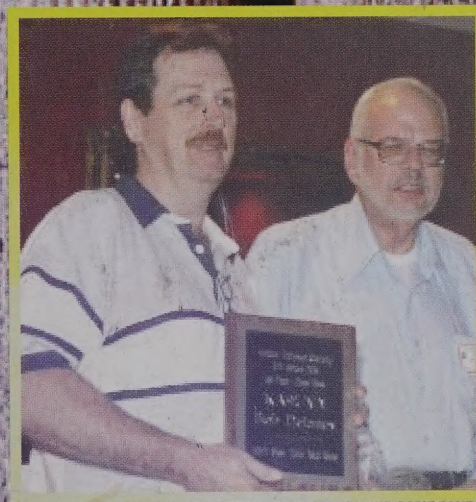
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# AMATEUR TELEVISION QUARTERLY



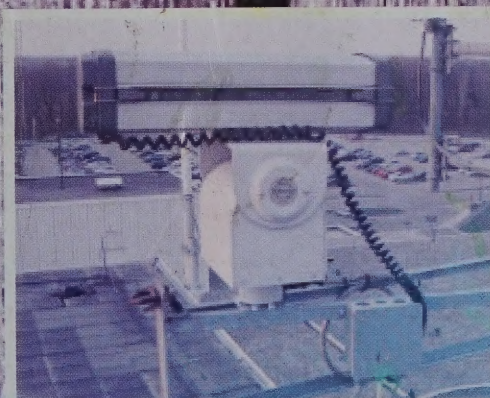
**Bob Heil speaks at ATV banquet**



**KA9UVY Wins ATV Contest**



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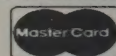




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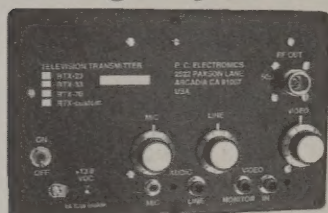


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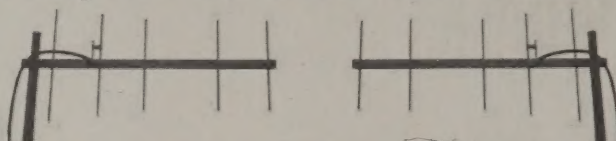
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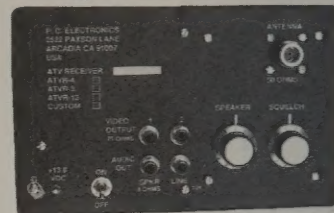


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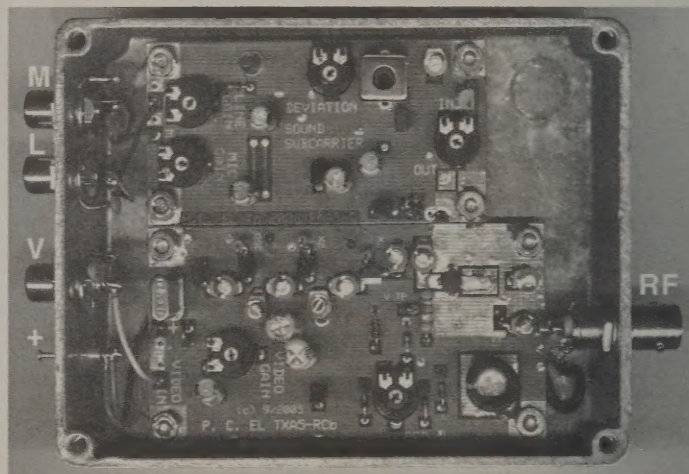
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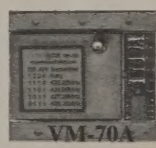
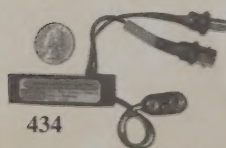
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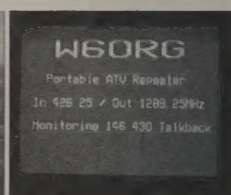
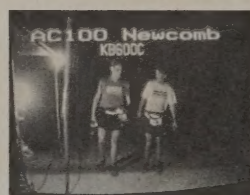
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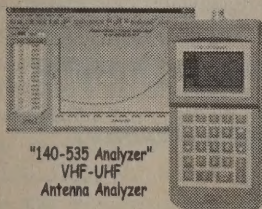
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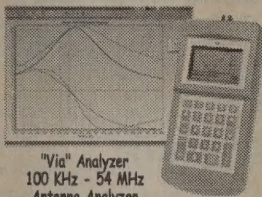
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# AMATEUR TELEVISION QUARTERLY

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## Far Horizons II Balloon Launch

Far Horizons II balloon flight 11/19/06 successful - landed 1754 4059.98N 08720.42 at grid EN60hx per last APRS packet.

Did not see any comment on this flight, so in searching for more information afterwards, saw that this flight was announced here, so joined the Yahoo group, and offer this post.

Flight announced #1359 ARHAB Launch Announcements  
[http://groups.yahoo.com/group/Balloon\\_Sked/message/1359](http://groups.yahoo.com/group/Balloon_Sked/message/1359)

APRS (WB9SKY-11) and camera. Module-2 1.5 lbs. APRS (W9KAO-11).

Sunday 19 Nov 06 09:00 CDT 14:00 UT

Far Horizons 2 Adler Planetarium & Astronomy Museum Chicago, IL  
Kankakee Airport, IL (3KK) 41° 6' 0.12"N 87° 55' 0.16"W

WB9SKY-11 144.390 APRS

W9KAO-11 144.390 APRS

Module-1 4.5lbs APRS (WB9SKY-11) and camera

Module-2 1.5lbs APRS (W9KAO-11)

### Comments:

While returning to Illinois along US-24 from the Ft. Wayne hamfest and Indiana State convention this past Sunday AM, I noted in the stations received LIST on my mobile Kenwood TM-D700 that there were two interesting APRS stations. Selecting one, noted that the changing high altitude and distance, as well as the SSID of "11" indicated a possible balloon flight. As my mobile position and the distant station position converged, monitored what sounded like a balloon QST and chase traffic via the National FM Simplex frequency. Since the balloon chase was only 20 miles north of my rolling position, I couldn't resist joining in the fun and "home in" on the group via the position range and distance available on the selected balloon station displayed with the rig "Detail" key.

Advised previously that this Kankakee, IL area was the launch point for the Far Horizon group by Gene, WB9MMM, when I was visiting the Rockford Amateur Radio Association recently. And the displayed APRS packet comment confirmed this balloon mission was Far Horizon II, a name associated with the Adler ham group from Chicago.

Backtracking into Indiana, then turning north to intercept the group, I homed in and found cars parked along a field on IN 114. Snapped a picture of the group from across the road as they scanned the sky for the descending payload.

I then noted that the position given by APRS was overhead and then was continuing south - past our position. Leaving the parked group behind, I drove ahead, then turned south at the next road intersection. Down this secondary road, I passed a car ahead that was parked with the occupants out watching across the field to my right in the west. I turned west at the next intersection until APRS display showed 0.1 mile, about a quarter mile down the road. Pulled over and was rewarded with seeing the instrument package and parachute land in the corn field stubble ahead and to the right. The last car observed just back on the next road passed by and parked ahead. Two chasers bailed out and began crossing the field on foot. I took off on foot at an intersecting angle directly to the landed package, and arrived as the payload was inspected from a distance, and have photos.

A fine group associated with the Chicago Adler Planetarium attended an after flight dinner, and some others were missed who did not attend. Videos and photos were reviewed there.

Dr. Mark Hammergren, Astronomer, Adler Planetarium  
Geza Gyuk, Adler Planetarium  
Imre Gyuk, Ph.D.  
John Russkamp, WA9KHX, Trustee of WB9SKY  
Linda Russkamp  
Don Russell, KB9AYF  
Gene Harlan, WB9MMM  
Chuck Ingle, AB9KA  
Rob Glowacki, N9MVO  
Kent Ochs, W9KAO  
Patricia Ochs, K9DEI  
Ryan Ochs, W9RAO, Mission Commander  
Derek Ochs  
Larry Oaks, WB9YAJ, Doppler DF team  
Bernie Heffernan, KB9AWS, Doppler DF team

Noted later at an after flight lunch meeting while photos and videos were played back from the flight payload camera that this device had taken a picture automatically of my foot approach. A copy was kindly provided by the group. This jpg image was much appreciated as a memento.

Thanks to all for letting me join in the "end game" hunt.

vy 73 de R. Patrick Ryan - KC6VVT  
[kc6vvt@juno.com](mailto:kc6vvt@juno.com)

ATVQ

## ATV OVER HF?

There are quite a few amateurs with an interest in ATV, but they live in "UHF-challenged" areas. For example, my QTH is in a rural area of the Colorado Rockies at 8,000 ft. above sea level, surrounded by 14,000 ft. mountains. So UHF-ATV is impractical from my QTH.

Fortunately for us "UHF-challenged" amateurs, there is an ATV mode, developed by Con Wassilieff, ZL2AFP, for HF. Known as "FFT-TV", this soundcard-based mode is used to send video clips over HF for playback at 10 frames/sec (FPS). The FFT-TV interface between the soundcard and HF SSB transceiver is identical to that used for SSTV. Video is sent in full color, at low resolution (36 lines), at 1 FPS. Alternatively, "live" video can be sent, also in full color at 1 FPS. Although the "live" video is choppy due to the low frame rate, it can be useful without subsequent processing. Or, after recording, the "live" video can be processed by frame-interpolation software, with frames added for resulting frame rates up to 10 FPS.

FFT-TV video can be sent together with audio, using independent sideband (ISB). ISB requires hardware modifications to the HF transceiver, together with DSP software. Details of FFT-TV and ISB are found in text and image files at WA6NUT's HamSDR pages at <http://www.hamsdr.com> (enter WA6NUT in the "Callsign Search" box on the HamSDR home page). The FFT-TV software is also available for download on these pages.

Rick Peterson, WA6NUT/Ø  
P.O. Box 4846, Buena Vista, CO 81211  
e-mail: [wa6nut@arrl.net](mailto:wa6nut@arrl.net)

ATVQ



# TWENTY-FIRST ANNUAL ATV BANQUET 2006 LITCHFIELD, ILLINOIS

By: Scott Millick - K9SM Email: [smillick@wamusa.com](mailto:smillick@wamusa.com)  
222 N. Jackson St.  
Litchfield, IL 62056



**Bloomington Group**

A perfect 50 degree clear sunny day on November 12, 2006 provided a pleasant trip for those traveling to the Twenty-First annual Central Illinois/St. Louis Area Amateur Television Club's banquet.

This dedicated group of ATV operators arrived for another evening of renewing friendships and meeting new members. The annual banquet was held at the Ariston Restaurant in Litchfield, Illinois, which is the central location for the club with members attending from the Bloomington, Mt. Vernon, Springfield, Champaign, Canton, Macomb, Illinois and St. Louis, Missouri areas. 53 members were present for the banquet this year.

Arriving first was Floyd Hofmann, W9EX, from Bloomington, Illinois. Others followed shortly and the talk about ATV openings, contesting, and equipment soon reverberated throughout the room.



**St. Louis Group**

The group was called to order at 5 PM by Scotty, K9SM, and after a few announcements the clatter of dishes, glasses, utensils, and chit chat continued throughout the course of a great meal and delicious desserts.



**Springfield Group**

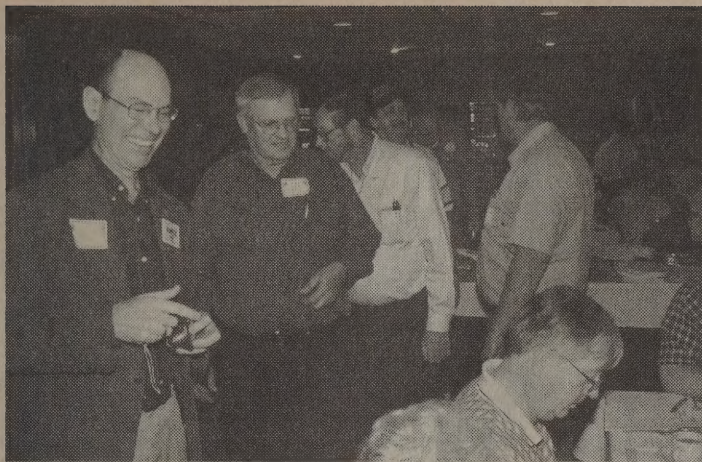
The program began with 3 special awards presented at the banquet this year by K9SM. Bob, KA9UVY, and Larry, KB9WLM, were given powder to help take off the shine from the lack of hair on their heads. KA9UVY was given a 2007 Illinois state map so he could find his way home. Listening earlier in the day on 144.34 there was considerable discussion between him and KA9EGM on how to get to the banquet location.



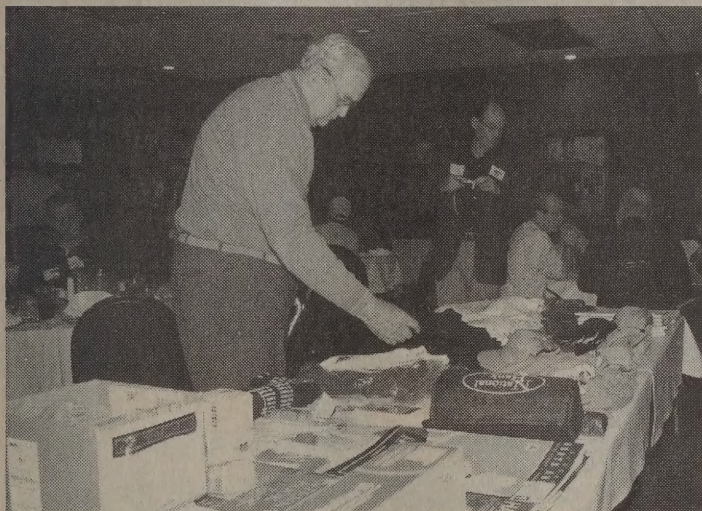
**Centralia Group**

Gene Harlan, WB9MMM, publisher of ATVQ Magazine, sent certificates to the club members attending who were winners of the recent ATVQ Contest. The following placed as follows and





**Visiting K0PFX**

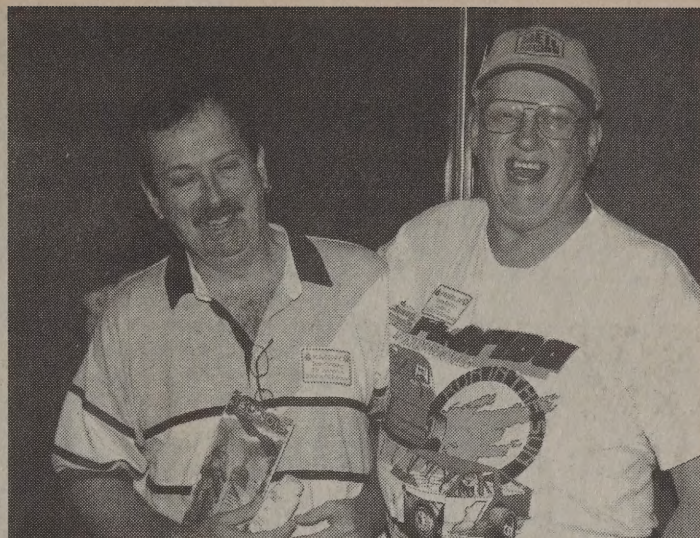


**Prize table**

received their certificates at the banquet; Ben Kiningham, K9IDQ, placed 8th; Scott Millick, K9SM, 6th; Jim Brueggman, KA9EGM, 4th; Leonard McWhorter, N9XHU, was 2nd; and Bob Delaney, KA9UVY, was awarded a certificate and plaque for the hours he spent tuning and calling resulting in his first place win. Leonard and Bob have been great competitors in this annual contest with both being winners in the past and the competition will continue in the 2007 contest next June - August.

Jim Brueggman, KA9EGM, from Centralia, Illinois was the sixteenth Central Illinois/St. Louis Area ATV Operator of the Year. Jim is always looking for ATV contacts and spends a lot of time doing this whether at home in Centralia or in Florida during the winter.

The highlight of the evening was a presentation by Bob Heil, K9EID, of Heil Sound. He first played a DVD of the induction of Heil Sound into The Rock and Roll Hall of Fame in Cleveland, Ohio. He told of how his early amateur radio experiments with a 128 element EME antenna led him



**Baldy Boys**



**KA9EGM ATV Operator of the Year**

into understanding the importance of phasing. Later when Bob worked with famous rock bands like the Eagles and designed sound systems that improved sound clarity at concerts his earlier amateur radio work provided many answers. He gave a demonstration of how important microphone design is and how to make it work better for the radio amateurs who work DX or

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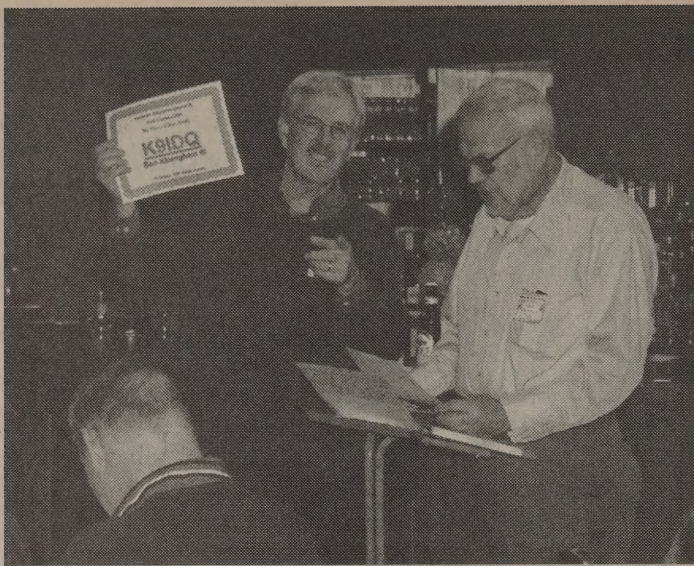
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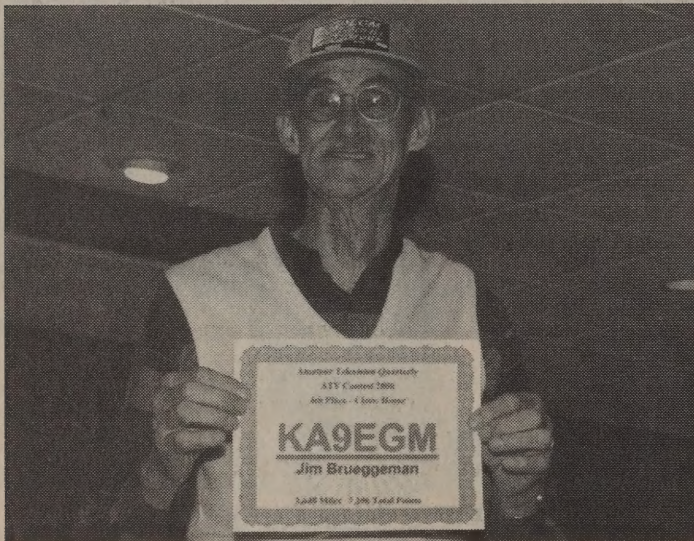
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**K9IDQ 8th Place**



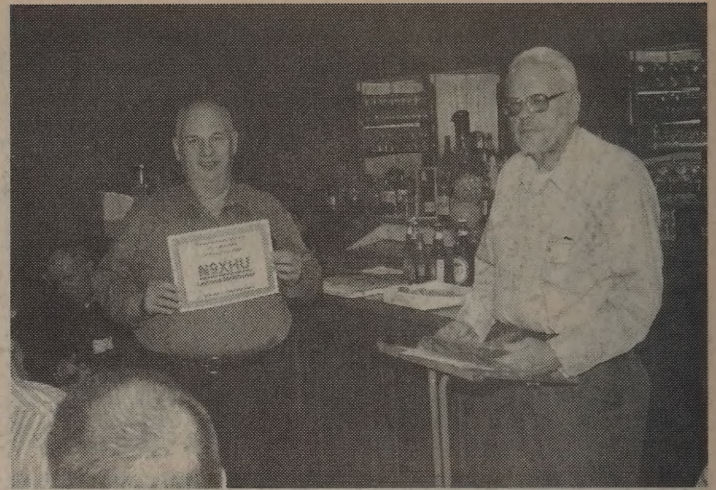
**KA9EGM 4th Place**

weak signals. He also explained and demonstrated how phasing works in noise canceling headsets.

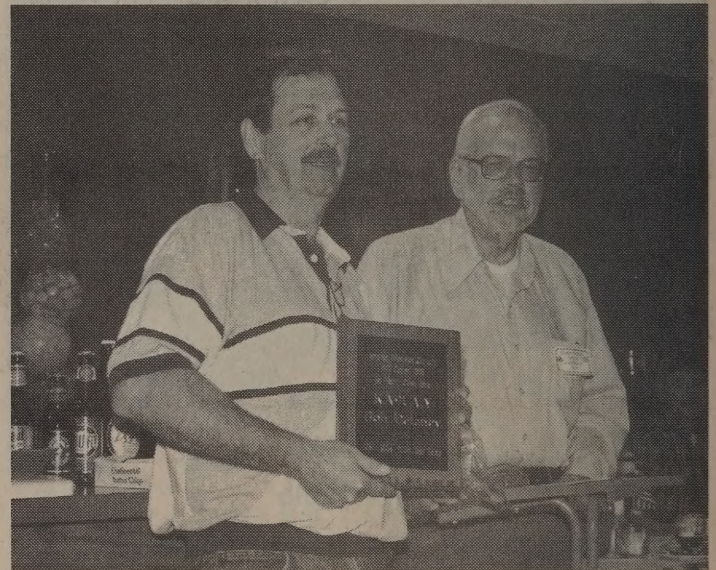
The famous prize drawing followed and it provided a lot of fun and laughs. The first person's name drawn had their choice of any of the 180 plus prizes. After that every person whose name was called can select a prize from the prize table or take a prize from someone who had already chosen one. That person then chooses another prize from the prize table. This led to some of the prizes changing hands over a dozen times. Everyone left with at least three prizes. The Bird wattmeter was won by Mel Whitten, K0PFX, from St. Louis, Missouri who was thrilled with his new goodie.

After the drawing more visiting followed and farewells were said. Everyone made their way home and are looking forward to the next banquet scheduled for November 11, 2007.

ATVQ



**Bloomington Group**



**KA9UVY 1st Place**



**Heads and tails game**





**Bob Heil Talks**

## Portland, OR ATV Repeater

Here is a little Blurb our our clubs activities this year.

Here in Portland Oregon we are 426 MHz in and 1.2 GHz FM out. For the past 12 years we have had our entire repeater up on the 375 foot level of the KGON Super Tower (about half way up).

This has been great because it has put the repeater system only 15 ft from the antennas. With no loss in the feed line it has spoiled us since it is a 700 foot run to the transmitter building. But every time maintenance is needed we have to hire a certified tower climber for the work.

This year we have been putting a system together that will house the repeater in the transmit building which is a 700 ft run of three sets of cables. The cost of doing this has always been prohibitive due to the cost of hard line. The only reason it is being done now is due to the free offering of cables that are no longer in use by other users. Plans to put a filter and then a preamp at the 426 antenna, another filter and preamp for a new 910 MHz input antenna and a power amp for 1.2 GHz at the antenna. This will not rid us of all the equipment up on the tower, but it will bring the major elements down to where we can service a little easier.

A 50 watt amp at the bottom will only give us about 5 watts at the top so hence the second amp at the top. Availability of 100 watt amps at 1200 MHz seems to be nil. Anyone with similar experiences and tips are invited to send them to me at [WB2QHS@arrl.org](mailto:WB2QHS@arrl.org). We will keep you informed.

Ed Mellnik WB2QHS

On another note.....

Portland Oregon has recently undergone a city wide WiFi system. Metro WiFi is installing sites that will cover the entire city. I find it interesting to note that if the ATV community were to put a 50 watt 2.4 MHz ATV repeater up, what would happen to most of that multi-million dollar WIFI service.

It seems to me that the FCC needs to allocate some new 2.4 MHz spectrum that will replace the loss of 2.4 MHz due to Wifi activity. With Wifi racket, ATV is virtually impossible to do without interference.

I believe the ARRL has also been remiss at protecting that spectrum for us. Part 15 devices were never meant to be set up like cell sites to achieve what they can't due to power limitations.

Ed Mellnik, WB2QHS  
Portland Oregon

ATVQ



# North American ATV DX Report

By: Bob Delaney - KA9UVY - Email KA9UVY@hotmail.com

10630 N. Delaney Lane

Mt. Vernon, IL 62864

DX Hotline 618-242-7063



## FCC DROPS MORSE CODE REQUIREMENTS FOR ATV OPERATIONS !!

Hold on just a minute, there haven't been any requirements for code to do ATV in quite a while, so why aren't you on??

I guess the headline in this issue should be winter is here and the band is still opening up! If you recall in the last report I said not to put the gear away just yet and boy am I glad I haven't.

On October 7th I made the best DX contact of my 13 years operating ATV! What made this contact special to me was not the fact that it was the farthest I have ever worked (513 miles), or even the fact that it was Oklahoma, new state #14!

What made it great was the fact that it proved one very important thing: IF YOU KEEP TRYING YOU WILL SUCCEED!!

The contact was with Rick, K9KK, in Norman, OK (Overland ATV DX Record Holder) and it started out around 7:10 am local time. I connected to Rick via Echolink that morning to see if he could run. The broadcast channels on UHF had been coming in from Dallas, TX, overnight along with the Houston area and southern Louisiana. The only broadcast station seen from OK was in Tulsa and it was only running up to P-4 with slow and deep QSB.

Rick fired up with video and with my narrow bandpass (if) filter on I had him locked P-1 within about 20 minutes. Now the excitement level was really picking up and my heart was pounding because it was my turn to transmit!

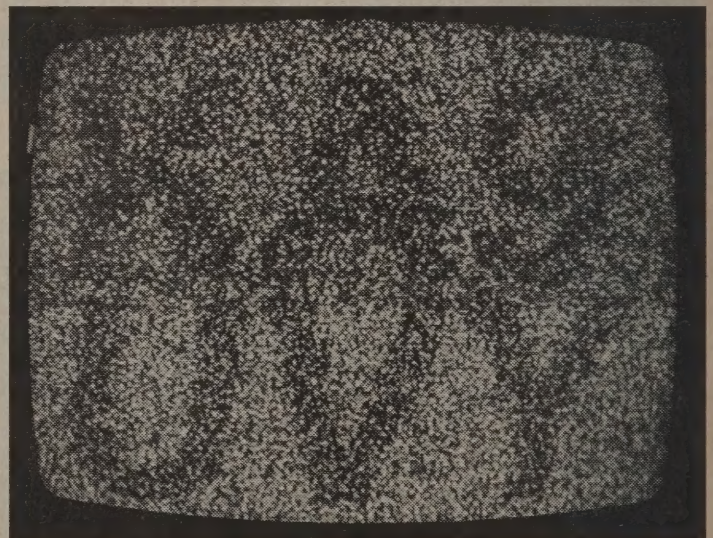
I held my breath and keyed the rig at about 7:30 am and waited to hear what Rick would say on the link. After waiting just a couple of minutes that seemed like hours Rick came back on and said, "Just a little sync in there so far keep it going." Oh no could it be? We had been running skeds all summer and now we would have to settle for a 1-way? NO, please not a 1-way!! The excitement here was incredible, minutes seemed like hours and after about 20 minutes of transmitting I couldn't stand it any

longer I had to see him again. Rick fired up and BAM He was still P-1. I kept watching his signal and it was indeed getting stronger (it wasn't over yet!). Rick built to P-2 and it was time again to send his way. At least 35 minutes had gone by and all of the knobs in my shack were showing signs of wear from constant adjustment. I came up again and this time Rick said "You're Locked, but I can't read it yet." After studying my biggest DX letters in the snow on his set for several minutes he said "I see UVY!!"

By that time Rick had called in his wife Pam and I had called Shannon into the shack for support, and another set of eyes. It was about another 20 minutes before Rick could make out the whole ID and this contact had just hit the one hour mark when he finally said P-1! I SEE IT, I SEE IT! Pam, do you see it??

I could hear his wife Pam in the background confirming what was on the screen as Rick started grabbing for the camera.

Rick sent me this screen shot of my signal coming into Oklahoma at about 8:30 am local time.



It wasn't what I would call great video but I couldn't be prouder of it. I had my handycam out that morning as well and grabbed his signal coming into Illinois as well. The first one is with narrow (if) bandpass filtering and the second shot is without. You can see that narrowing the bandpass is very effective for DX contacts if the station is using a BIG ID to make up for the loss of resolution.





Rick and I both agree that the key to making this 2-way contact was coordination and effort. Echolink is a very good tool to use when you're trying to work ATV over a great distance. Aside from getting my best ATV DX so far the skeds with Rick have also paid off in a great new friendship :-)

## THANKSGIVING BAND OPENING??

Well, we all have heard about or remember that traditionally the holidays, especially Thanksgiving, have given us some great DX openings in the past. This year had all of the signs of doing it again! The weather has been very mild for this time of year and the Troposphere has been producing DX conditions for many of us. In my area the band started to come to life the night before Thanksgiving with W9ZIH, Malta, IL, and NK9M, Oswego, IL, both putting in P-4 or better video from over 225 miles. W9ZIH

also enjoyed a 1.2 FM video exchange with K9SM of Litchfield, IL, with P-4 video exchanged at approximately 200 miles. I continued to watch the area of Tropo move away from S. IL, NE, and the UHF TV channels start coming in from N.OH, MI, and NW PA. By Thanksgiving morning a nice area of Tropo had developed for OH, IN, MI, and W PA.

The ATV Logger showed that indeed some were taking advantage of the opening and I received this report from Bryan, KC8LMI, in Pleasant Lake, MI of what he was able to work. This list looked like a contest log to me and would have placed pretty well in any ATV DX contest !

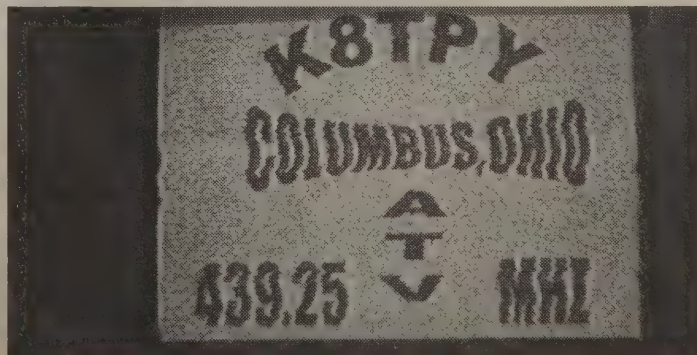
W8RRF, Winchester, OH - 194 miles P-5 2-way  
 KB8YMQ, Plain City, OH - 166 miles P-4 2-way  
 KB8SSH, Columbus, OH - 178 miles P-2 2-way  
 W2WHK, Tonowanda, NY - 279 miles P-3 2-way  
 K8TPY, Columbus, OH - 178 miles P-4 2-way  
 N2WUT N. Tonawanda, NY - 279 miles P-3 2-way  
 K2CEC, South Wales, NY - 290 rec'd LMI @ P-3  
 WU8O, Plain City, OH - 166 miles P-5 2-way  
 KA8LWR, Bucyrus, OH - 129 miles P-5 2-way  
 W8ILC, Huber Heights, OH - 175 miles P-4 2-way  
 KB9JGF, Lynn, IN - 164 miles P-5 2-way  
 NR8TV, Greenfield, OH - 218 miles P-5 2-way  
 K8PYQ, Mount Victory, OH - 153 miles P-5 2-way  
 WB8DZW, Hillard, OH - 174 miles P-4 2-way  
 W8ZCF, Cincinnati, OH - 230 miles P-5 P-3 2-way  
 WA8KQQ, Greenville, OH - 159 miles P-5 2-way  
 WA8SJV, Delaware, OH - 162 miles P-4 2-way  
 N8LRG, Grove City, OH - 182 miles P-4 2-way  
 KA9UVY, Mt. Vernon, IL - 370 miles P-1 2-way

Bryan also noted the following ATV repeaters:

Dayton, OH. - P-4  
 Columbus, OH. - P-5 see pic  
 Ft. Wayne, IN. - P-5 900 Mhz see pic  
 Flint, MI. - P-4

As you can see KC8LMI was quite busy on Thanksgiving, all of these contacts made in one day is truly something to be Thankful for and quite an achievement. The signals were mostly P-4's and 5's so I am sure that many of these operators saw each other face to face for the first time on ATV!

With all of the activity Bryan failed to take as many pics as He would have liked but he did get a few.





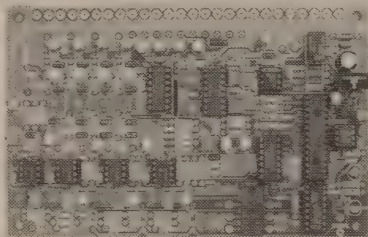
## ATVC-4 Plus

### Amateur Television Repeater Controller

ATVC-4 Plus is Intuitive Circuit's second generation Amateur Television repeater controller. ATVC-4 Plus has many features including:

- Five video input sources
- Four mixable audio input sources
- Non-volatile storage
- DTMF control
- Beacon mode
- Robust CW feedback
- Password protection
- Many more features

For example a major new feature is four individual sync detection circuits allowing for true priority based ATV receiver switching. \$349.00



### Intuitive Circuits, LLC

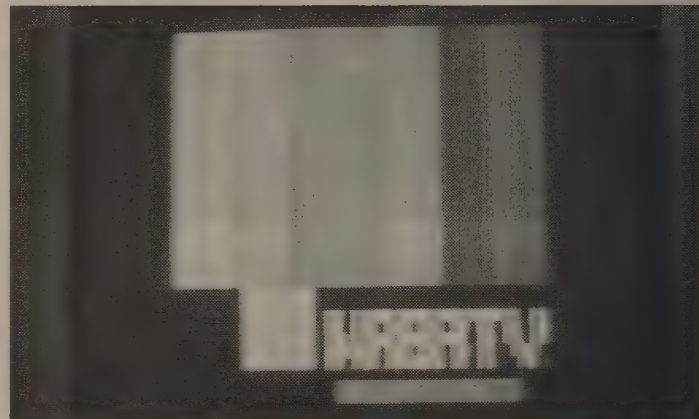
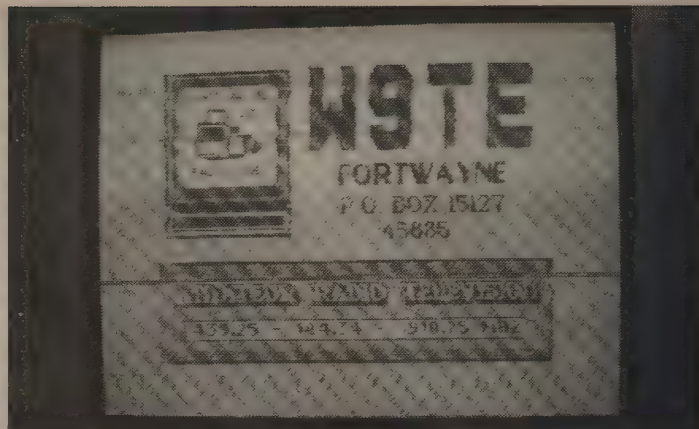
3928 Wardlow Ct. - Troy, MI - (248) 588-4400

<http://www.icircuits.com>

Enhanced conditions remained over this area of the country for 2 days and I am sure other contacts were made that were not reported.

KC8LMI also made an interesting observation on Christmas Eve seeing an ATV repeater output on 432 Mhz! Yep it was out of Windsor, Ontario, Canada and the ID slide indicated an input of 439.250 Mhz.

I will try and get more information on the mystery Canadian ATV repeater for the next issue.



## ATV DXERS LIST:

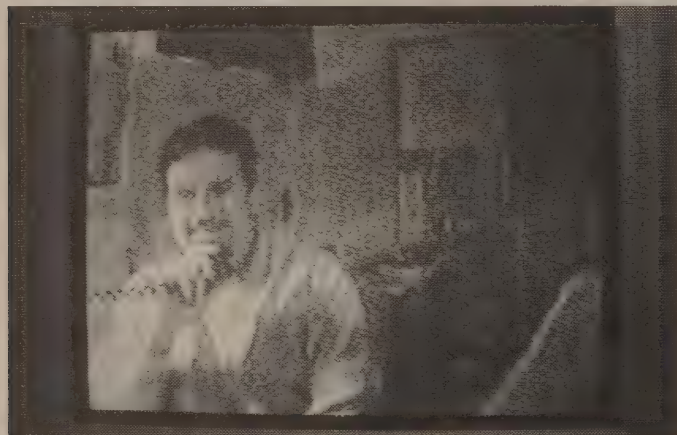
Since the DXers list was published last issue I have had 2 stations submit their info and a correction on another. WB8ELK in AL., and KD0FW in MO. were added. Please send in your information if you would like to be on the list and would be willing to run DX schedules on ATV. An updated list will be available in 2007.

## Tennessee back on the air!!

If you have been around ATV DX for several years then you know that nobody down there has been active on ATV for several years. All of that has changed now since Todd, N4QWZ in Greenbrier TN has returned to ATV. Todd was active as KC4QWZ when he left the air in 98. He has returned and has been putting in reliable P-1 to P-2 video here in S. IL from his location just North of Nashville 170 miles from me. (insert n4qwz1.jpg)

Todd is running a Cushcraft 729B antenna above 60 feet and driving an RFC 4-110 with his P.C. Electronics TC-70-10.

Also since returning to the air He has introduced another TN. Ham to ATV DXing. Truett, KG4PSR from Bradyville, TN has hit the air from about 40 miles SE of Nashville. Truett runs a homebrewed array of 4 FO-22's @ 80 feet fed with 7/8 Heliac. He also has the SSB SP7000 mast mount for a very sensitive receive. His transmitter right now is a loaner from me and is





P.C. Electronics driving an RFC 4-310 for about 25 watts avg. Truett is learning about the mode and looking to get some more power online down the road.

Both of these operators come from a weak signal background and know how to spot and work an opening so We all have a real good chance to work into TN when the band opens up.

## THERE'S ALWAYS NEXT YEAR!

Looking back at 2006 I can say that it was a pretty poor year for DXing early but finished strong. We can only hope that 2007 has better propagation and that more ATV operators will activate their part of the country in the future.

I would like to thank everyone who has supported this column in the past and I hope there will be enough support for it to continue in 2007.

Even if you do not send in any information for this column you can support it by getting on the air as often as possible in 007 and continuing to subscribe to ATVQ. I look forward to seeing you on ATV next year!

**WANT TO KEEP THIS COLUMN IN ATVQ?**

**SEND IN YOUR DX REPORTS AND PIX!!!**

## Important DX Info:

The new ATV DX Record page at P. C. Electronics:

<http://www.hamtv.com/atvdxrecord.html>

If you have done better, be sure and send your information to Tom at P. C. Electronics. Let's hope we see those records grow this summer!

The Hepburn tropo forecast page:

<http://www.dxinfocentre.com/tropo.html>

If you are online you can post ATV CQ's and reports to the ATV Logger page:

<http://dxworld.com/atvlog.html>

ATVQ

## Paris Mobile ATV

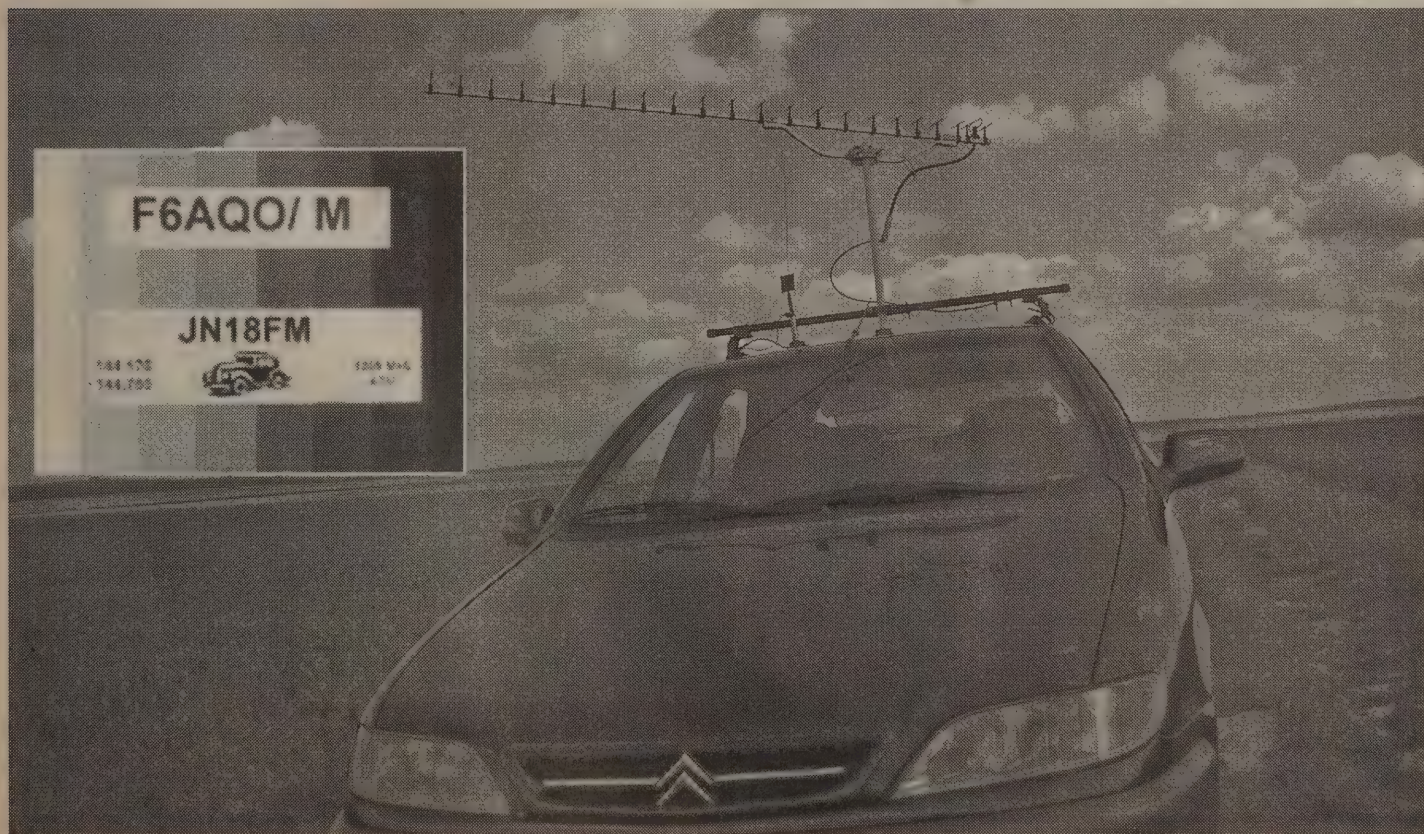
73 to ATVQ team from PARIS area.

François Muller F6AQO/ Mobile ATV [mullerfrancois@wanadoo.fr](mailto:mullerfrancois@wanadoo.fr)

438.5 RX/TX AM ATV 20 W 4 element yagi

1255 RX/TX FM ATV 50 W 2 x Hybrid quad 9 dB & 23 el. yagi

ATVQ





# NearSys 06D: Me And My PongSats

## The University of Nebraska at Omaha (UNO)

### Teacher's Workshop

By Paul Verhage - KD4STH Email: [Paul.Verhage@boiseschools.org](mailto:Paul.Verhage@boiseschools.org)  
5720 3rd Ave.  
Nampa, ID 83686

I had a great experience last July when I was invited to participate at the UNO teacher workshop. The workshop was a BalloonSat workshop, similar to the one developed by the University of Colorado in Boulder. At this workshop new teachers designed BalloonSats and launched them. But before I tell you more about my adventure, I want to thank Mark Conner (N9XTN) of NSTAR for helping me out. You can read more about Mark's near space program, Nebraska Stratospheric Amateur Radio, at [www.nstar.org](http://www.nstar.org). Mark and I go back to 1997 when we met at the St. Joe hamfest.

### T Minus One Day

Most teachers had completed their BalloonSats by the time I arrived. Their BalloonSat airframes were made from foam core and hot glue. For readers not familiar with foam core, it's a 1/4 inch thick layer of stiff Styrofoam with a paper coating on both faces. It's most often used for the backing for posters and other similar artwork.

Inside their BalloonSats, teachers placed a Hobo data logger ([www.onsetcomp.com](http://www.onsetcomp.com)), APS film camera, and a passive experiment. One of the passive experiments was a passenger, a hissing cockroach. I don't know if you every seen one of these things, but they're big. Unlike other insects, they can exhale air to produce a hiss when threatened. Not that I'm going to threaten the mother of all cockroaches. Another passive experiment I saw was a plastic box filled with mealy worms. Every animal (only insects so far) I've seen launched into near space was sacrificed in the name of science. I expected the same on these BalloonSats.

After arriving, I briefly explained to the teachers attending the workshop what to expect during the flight. Afterwards we attached their BalloonSat to the rest of the near spacecraft. It sure was a pretty sight to see everything, including the parachute, connected into a stack. To prevent damage to the stack, we left it overnight inside the classroom. Since we were meeting at the school the next morning, we could wait to load the near spacecraft into the car until then. Afterwards we'd all caravan to the launch site and make sure no one got lost.

### PongSats

I launched my first PongSats on this mission. What is a PongSat? It's a ping pong ball designed to carry experiments into near space. The concept was developed by JP Aerospace in California. Check out their website at [www.jpaaerospace.com](http://www.jpaaerospace.com)

for their PongSat documentation. At this time there isn't much documentation on the PongSat, so I had decided during my last near space flight to experiment with them.

The PongSats on mission NearSys 06D were tests of PongSat modifications. Instead of sawing a ping pong ball in half and stuffing an experiment inside, I cut a neat 3/4 inch diameter hole in a ping pong ball and glued a cardboard rocket tube inside. Instead of taping the ping pong balls halves back together with scotch tape, I cut an oversized hatch from a second ping pong ball and taped that over the opening in the first ping pong ball. This created a neat storage space inside the PongSat with a good fitting hatch.

So that the PongSats could be suspended from the near spacecraft, two small holes were drilled vertically through each ping pong ball. The holes are drilled with a spacing between them that allows the cardboard rocket tube to pass between them. Two small diameter plastic tubes are glued through the holes. The tubes act as raceways for Dacron kite line. The Dacron line forms a loop that suspends the PongSat below the rest of the near spacecraft. The raceway protects the skin of the ping pong ball from abrasion by the Dacron. Without the tubes, I suspect the Dacron will eventually rip up the plastic ping pong ball.

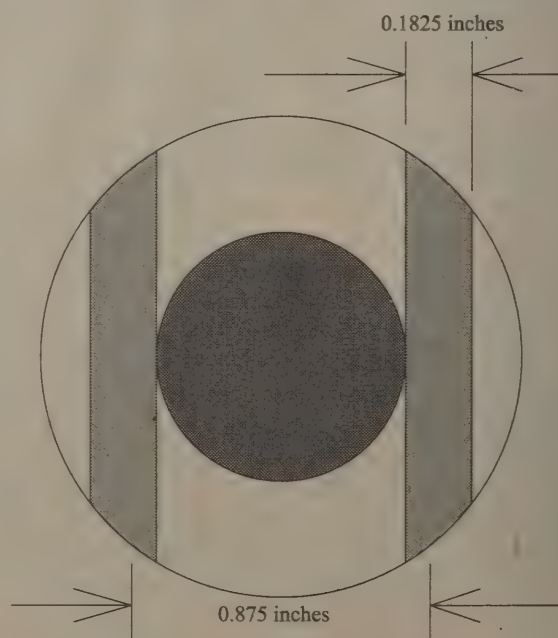
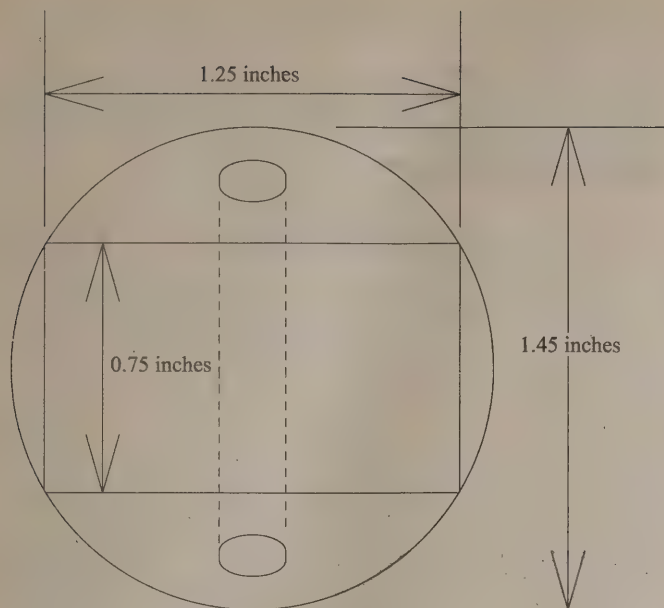


Diagram of one of my PongSat designs





**A side view of my PongSat design**

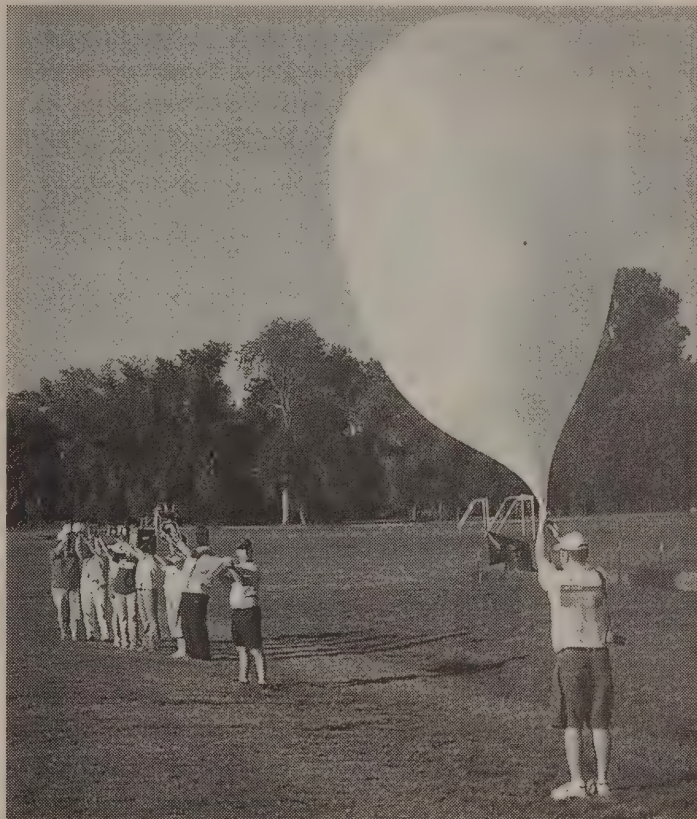
There were three PongSats on this mission. Two of them were thermal tests. One was painted black and the other silver. Both carried Thermochrons. Thermochrons are metal cans the size of five stacked dimes. They contain a lithium battery, temperature sensor, memory, and real time clock. Thermochrons are programmed (with a PC) to record the time and temperature at a rate selected by the user. They can be programmed with a delay, that way they can be programmed for mission several days in advance. Then days later, its data can be downloaded and graphed.

## Launch Day



**Since there was a light breeze this morning, the teachers helped stabilize the balloon. This ensured no strong gust of wind would knock the balloon into the ground and burst it.**

Mark Conner met us at a park north of Omaha. He was there with his filling equipment and a tank of helium. Mark couldn't go on this chase, but he could help out with the launch. That's because if he was going to attend the Great Plains Super Launch two weeks later, he had to baby sit his kids this weekend. Mark and I made sure to involve the teachers during the filling and launching of the balloon. We tried to explain everything to them. After all, this was their workshop.



**The near space version of A Chorus Line.**

**Mark (N9XTN) is holding the balloon and teachers in the workshop are holding the modules of the near spacecraft. In a few moments Mark will release the balloon and it will drift over the teachers as it rises. Since the teachers are only supporting, and not holding, their modules, the modules will safely lift out of their hands.**

The launch was perfect, so after watching the balloon for a few minutes, we picked up the launch gear and loaded up the car. The chase crew drove far enough ahead of the near spacecraft that we had time to stop at a gas station. The time waiting for balloon burst was spent feeding the cars and ourselves. While waiting, we were able to locate the balloon in the sky for the teachers. They were surprised to be able to see the balloon in near space. The balloon reached a maximum altitude of 92,720 feet and several of the teachers were watching the balloon when it burst. That signaled that it was time to put the pedal to the metal.

The recovery site was a corn field located 74 miles south of the launch site. On the good side, the parachute was bright orange, so it couldn't hide in the corn. On the bad side, the corn was



very tall and the field had recently been irrigated. From the road we could look over the corn and see a bit of the parachute. But the way the field was cultivated, there was no way to walk straight down a corn row to the near spacecraft. Instead of being planted in straight rows, the corn rows followed the contour of the ground and forced us to walk a curved path into the field (or to cheat by cutting across the corn rows and hoping that we didn't knock down too many corn stalks). Eventually we got close enough to hear the near spacecraft's audio beacon. If it had not been for the beacon, it would have taken much longer to recover the capsules. As you can see, the corn was very dense and too tall for us to see over once we were in the field.



**We were literally right on top of the capsules before we could see them in this field.**

I discovered that my PongSats didn't remain closed. Landing in the corn stalks was enough to rip their hatches off. Fortunately we were able to recover one of the Thermochron payloads on the ground. It was obvious that I would have to redesign the hatch mechanism before the next time I launched a PongSat.

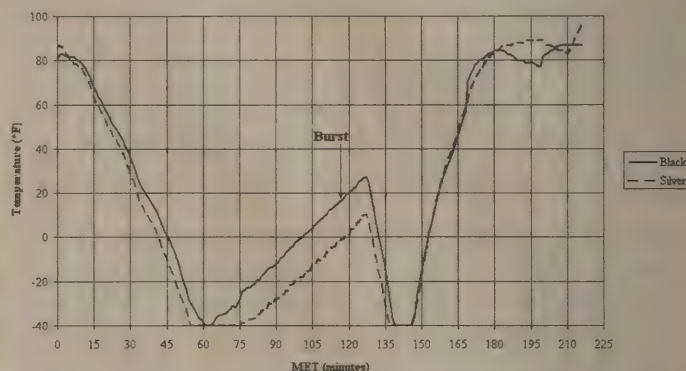
We had recovered the near spacecraft, but we still needed to get out of the corn field. Since only a few teachers went into the field, we had excellence guidance getting out of the field from the other teachers. Many of us then spent the next ten minutes cleaning the mud out off our shoes.



**Boy does Nebraska have sticky mud.**

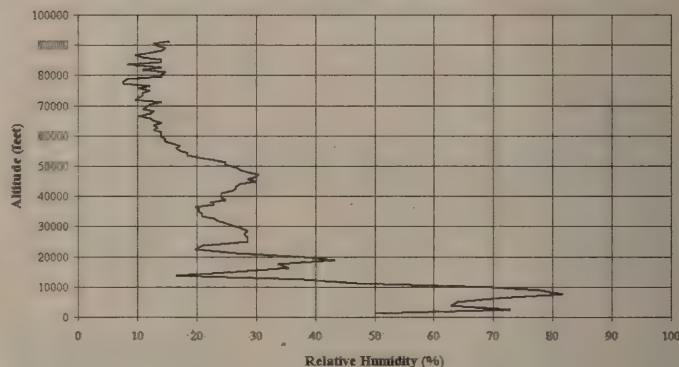
I knew the hissing cockroaches wouldn't survive the flight, but I was surprised to see that the mealy worms were still alive. They were in a stupor from the cold, but as they warmed up, they began moving around again. Perhaps being packed in loose soil protected them from the near vacuum. Here's some of the other data collected on the mission.

**NearSys 06D**  
PongSat Temperatures (Thermochron)



Notice that in near space the black PongSat took longer to cool down and was faster to warm up than the silver one. At balloon burst, the high speed air moving over the PongSats pretty much chilled them at the same rate. The chart bottoms out at -40 degrees because that's a Thermochron's minimum temperature. That's pretty standard for industrial equipment.

**NearSys 06D**  
BalloonSat Relative Humidity



The Hobo datalogger carried on this flight recorded the dryness of near space. From the spike at 8,000 feet, I imagine we had a cloud bank at that altitude. Unfortunately I don't recall if I saw clouds that day.

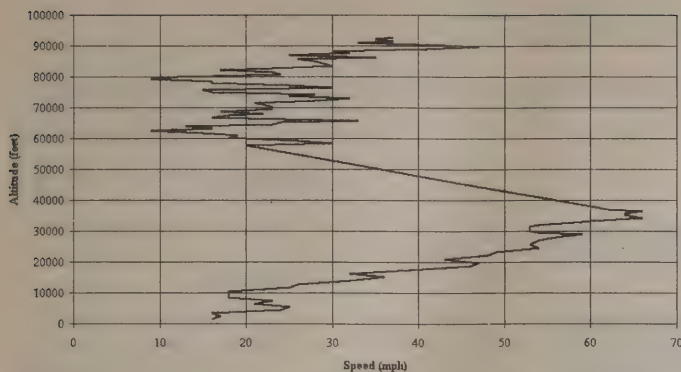
It was great to visit Omaha this summer. After recovery of the near spacecraft I had time to spend the evening in an older part of Omaha called the Old Market. It's not Berkeley, but for Nebraska, it's close enough. The next morning I left for Idaho but first stopped for lunch in Boulder, Colorado, another fun town to visit. If your radio club is interested in holding a BalloonSat work shop, then contact me via email and let's see what we can work out for summer 2007.

Onwards and Upwards

ATVQ



NearSys 06D  
Winds



The GPS receiver gave us the wind speeds during the mission. Our highest speed wind occurred at 35,000 feet at 65 mph. That's not much of a jet stream. If it had been, we would have chased farther. Notice the mission experienced additional high speed winds at 90,000 feet. In most summer launches it's usually quiet at these altitudes. The same cannot be said for winter time launches where winds greater than 100 mph can be found at 100,000 feet.

## News From Danielsville, GA

KQ2Q and KE4GVX are busy testing the ATV path on 439.25 Mhz from Arnoldsville, GA to Danielsville, GA. We are located near Athens, GA and looking for others to give ATV a try. We are currently running vertical polarization due to existing antennas.

## Equipment at KE4GVX:

PC Electronics Transceiver with a Mirage 100 watt amp. Mast mounted preamp w/ hardline. Running a K1FO long boom beam at 50 feet or so.

## Equipment at KQ2Q:

Homebrew solid state exciter running into a K2RIW Kw amp. Antenna is a Comet vertical at 70 feet with hardline. Using a Janel Converter and Janel preamp for receiving. Bob has been working ATV for about 30 years and one of the original New Jersey ATV pioneers.

## Future Plans:

We are currently trying to increase activity in the Athens, GA area. Robert (KE4GVX) is about to install a 160 foot tower where we may install an ATV Id Beacon. The Beacon will be on 439.25 Mhz and most likely operate evenings and weekends via remote control. Power will be approximately 20 Watts. We would like to extend an invitation to all Hams in the area to visit our stations and Get the Bug !!!

Regards,

Bob Owens - KQ2Q  
Danielsville, GA



# Renew Today!

## Hamvention ATV Forum 2007

This year we have our regular time slot back for the ATV forum. The room number has not been assigned yet, but final details will be in the Spring issue of ATVQ. This is the line-up of speakers as we know as we go to press.

**12:00 to 12:05 - WA8RMC, Art Towslee "Welcome and Introductions"**

**12:05 to 12:20 - K3ZKO, Ron Cohen "Getting Started in Amateur Television"**

**12:25 to 12:40 - WB9MMM, Gene Harlan "Emergency Communications Using ATV - The Possibilities"**

**12:45 to 1:00 - WA6SVT, Mike Collis "Linking ATV Repeaters"**

**1:05 to 1:20 - WB8ELK, Bill Brown "Airborn ATV"**

**1:25 to 1:30 - WA8HFK, Frank Amore "ATCO Picture Slide Show"**

**1:35 to 2:00 - AA9XW, Henry Ruh "Some Bits about TV Bytes"**

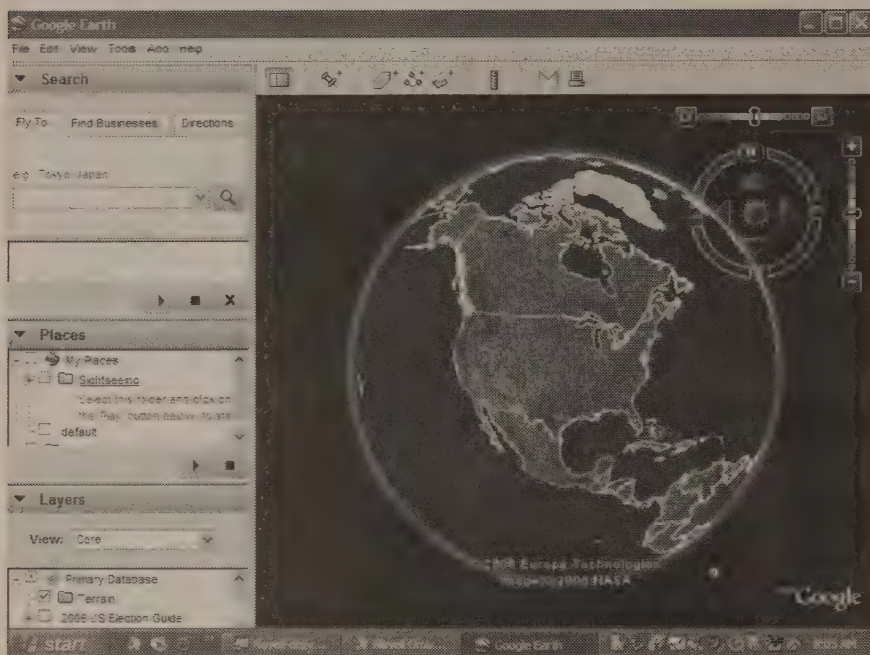
Kind regards,  
Art Towslee - WA8RMC  
ATV forum chairman





# Charting Near Space Flights with Google Earth

By Paul Verhage - KD4STH Email: [Paul.Verhage@boiseschools.org](mailto:Paul.Verhage@boiseschools.org)  
5720 3rd Ave.  
Nampa, ID 83686



I began experimenting with Google Earth in the Fall of 2006, after it was recommended to me by Mark Hammergren of the Adler Planetarium. What I've been able to do with Google Earth and near space is pretty neat and I'd like to share it with the readers of ATV Quarterly. First, Google Earth is an online database and application. So you'll need access to the Internet to run Google Earth on your PC.

To install Google Earth, start your browser and go to the website, <http://earth.google.com/>. There you'll find a link called Get Google Earth (Free Version). Click on this link and install Google Earth on your PC.

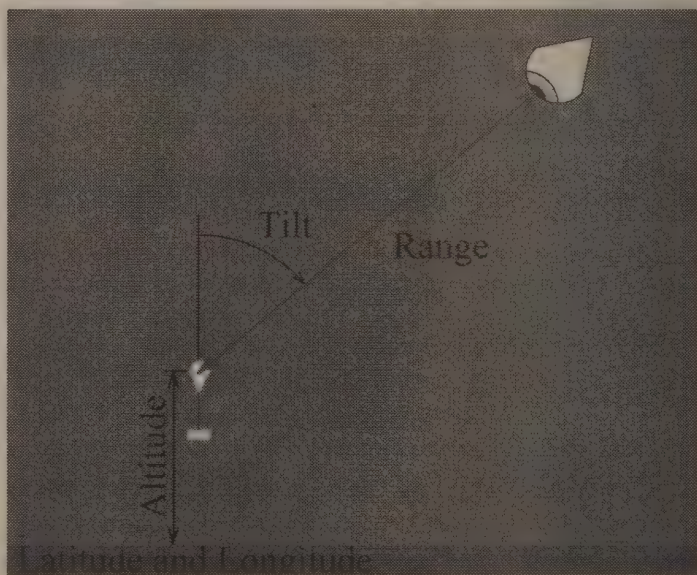
A balloon's flight path is coded in a KML file and there's a short KML tutorial at, [http://earth.google.com/kml/kml\\_tut.html](http://earth.google.com/kml/kml_tut.html). Download the tutorial and look at its sample KML file. In the rest of this article I'll explain how I modify the sample KML file for my near space flights. Like HTML, KML commands, or element names, are written in the brackets, < and >. Parameters for a particular command are written after the <COMMAND> begins and before the </COMMAND> ends. Simple, right? Great, now let's start editing.

The first element names to edit are <DESCRIPTION> and <NAME>. I write the mission name between <DESCRIPTION> and </DESCRIPTION> and the date of the launch between <NAME> and </NAME>. This way when a balloon's

flight path is clicked on a Google Earth map, the mission name and date are displayed.

Next edit <LOOKAT>. The seven elements of <LOOKAT> indicate where in three dimensional space to place and point your eyeball. <LATITUDE>, <LONGITUDE>, and <ALTITUDE> indicates the point above the earth to stare at. <RANGE> and <TILT> indicates the distance and angle to look from. And <HEADING> is the compass direction your eyeball points. Since the near spacecraft's GPS altitude is with respect to mean sea level, <ALTITUDEMODE> is set to ABSOLUTE. Here's my diagram of what the <LOOKAT> element names mean.

<LOOKAT> in my KML file is a point at the center of the near spacecraft's flight ground track and half way up to its maximum altitude. The tilt is 90 degrees (horizontal) and the heading of 0 degrees (true north). And the range is equal to the flight path's maximum altitude. Now watch out, the altitude and range elements are in units of meters.



The next two name elements to modify are <LINESTYLE COLOR> and <WIDTH>. <LINESTYLE COLOR> is a four byte field, with the first byte indicating the transparency of the line and the remaining three bytes indicating its color. A transparency of hex 00 is an invisible line and a hex value of FF is a fully opaque one. The next three bytes are for the colors blue,



green, and red (in that order). In my KML files I set `<LINESTYLE COLOR> ff000000 </LINESTYLE COLOR>` to draw a flight path as a fully opaque black line. I use `<WIDTH> 2 </WIDTH>` just because that seems to work well. To draw a thicker line, use a number larger than two.

The last name element to modify is `<EXTRUDE>`. Extruding a flight path drops a curtain from the flight path to the ground. I find the curtain confusing, so I don't have it drawn. To NOT extrude a flight path, type `<EXTRUDE>0</EXTRUDE>`.

Now it's time to add the coordinates of the balloon's path. There's only one coordinate per line of text and each coordinate is a point in three dimensional space with the following format; longitude, latitude, altitude. Since the United States is west longitude, longitudes here are written as negative numbers. If your balloon's path is drawn over western China, you forgot to make your longitudes negative. The longitude and latitude are written in decimal degrees. So you need to convert the APRS log from degrees and minutes of latitude and longitude into decimal degrees of latitude and longitude.

It's easier to let Excel convert the comma delimited APRS log into the proper format. I use these Excel equations to do all the hard work.

Longitude  
= -H3-(I3/60)

Latitude  
= +F3+(G3/60)

Altitude  
= +J3/3.28

Where,  
F column is degrees of latitude  
G column is minutes of latitude  
H column is degrees of longitude  
I column is minutes of longitude  
J column is altitude (in feet)

Note: If the APRS log is raw GPS sentences, then the altitude is already in units of meters. However, if the APRS log is from a Tiny Trak, then the altitude was converted to feet, so you'll have to change it back.

Copy and paste the equations down the three columns of the work book and you'll have your properly formatted position reports. To have Excel create the final comma delimited text file of balloon positions, highlight all the three cells with the properly formatted longitude (negative), latitude, and altitude. Then cut them out and start a new workbook. Paste the three columns in the new workbook and save the work book in a

comma delimited format. That's an option in SAVE AS called CSV (Comma Delimited). Close down Excel, you're done with it.

In Windows Explorer right click on the saved comma delimited file once and open it with Notepad. Now copy the entire text and paste it into the KML file between `<COORDINATE>` and `</COORDINATE>`. To save the file as a KML file under Notepad, you have to Save As and select ALL FILES as the type. This lets the file name end with a .KML.

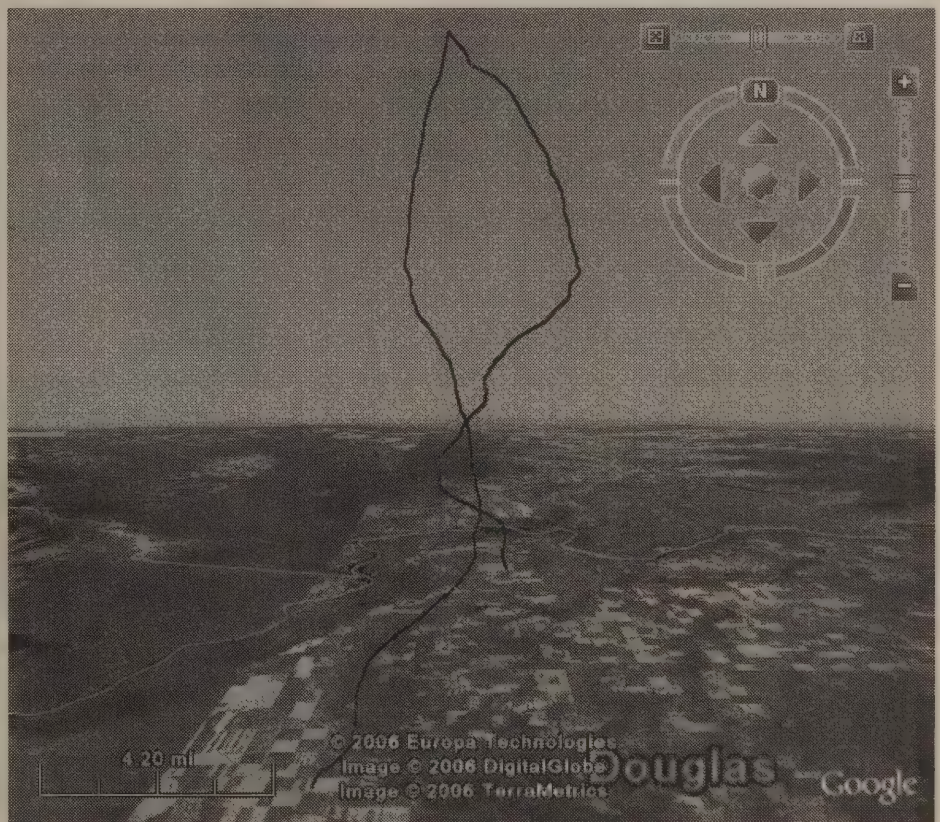
Now start Google Earth and open the new KML file. Google Earth begins with a view of earth from space and zooms down to the LOOKAT point in the KML file.

Try changing the range by clicking on the ground and dragging the mouse. There are three more controls you can play with in the upper right hand of the screen. The compass rotates to a new heading, the vertical slider bar on the right side changes the range, and the horizontal slider bar on top changes the tilt. You'll get a three dimensional feel for the flight path by moving around it with these controls.

When you're happy with the display of the flight path, save the image by clicking on FILE > SAVE > SAVE IMAGE. Here's an example of what you'll end up with.

If you're ready to give Google Earth a try, go to my near website, <http://nearsys.org> and download a few KML files to experiment with. You'll find KML files for some of my near space missions under Flight Reports.

ATVQ





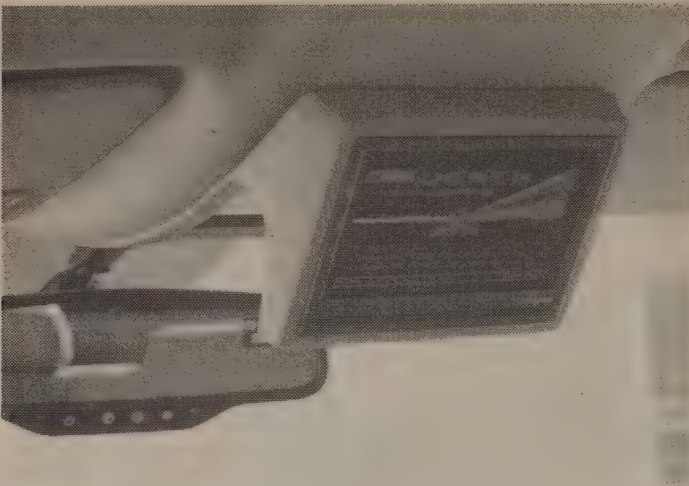
# WA6SVT Mobile ATV

By Mike Collis, WA6SVT

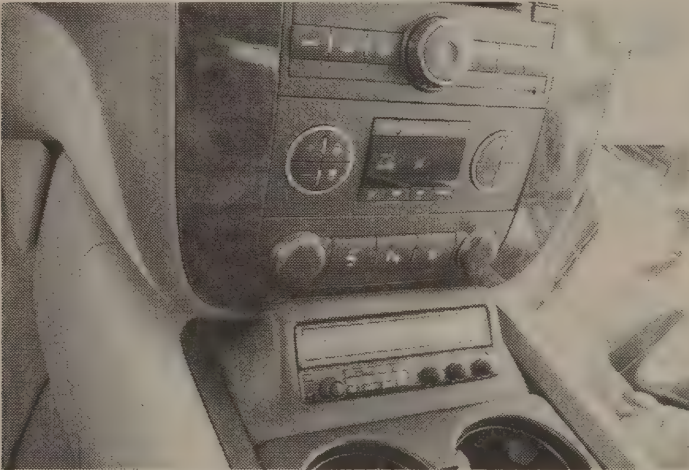
Email [wa6svt@aol.com](mailto:wa6svt@aol.com)

POB 1594

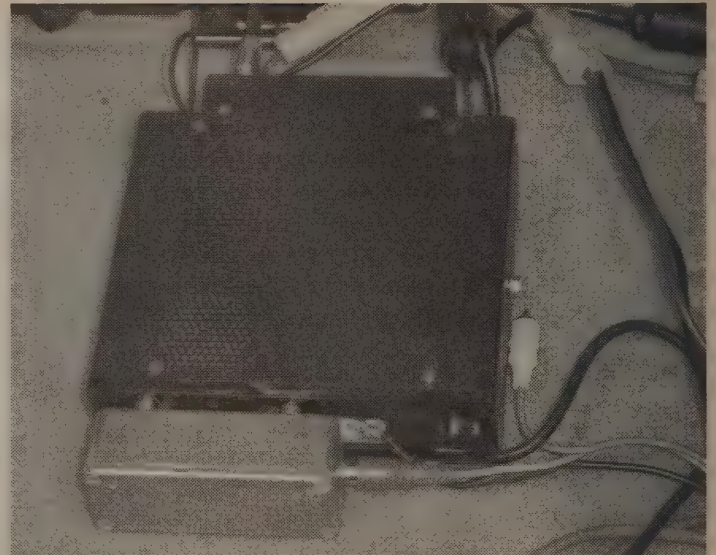
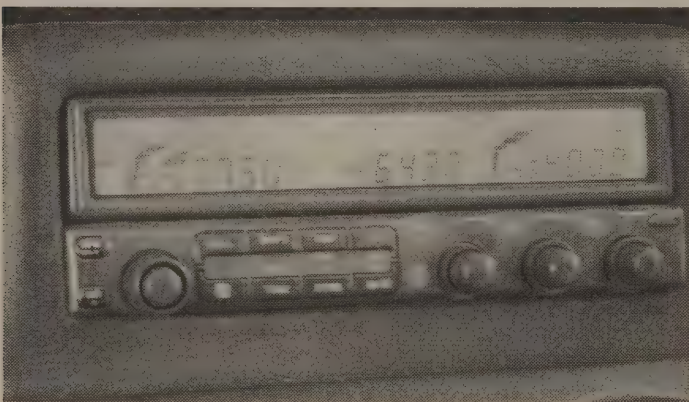
Crestline, CA 92325



My 2007 Chevy Avalanche custom interior with three Alpine LCD monitors, two in the back head rest for my daughter to view DVDs or ATV and one in the front so the center back set gets a good view angle (works when I pull over to operate ATV receive) and full ATV receive. The Alpine monitors are the best I have ever used to lock solid on an ATV signal, even better than a CRT monitor.



I converted my Kenwood TM942 tri band rig (146, 440 and 1.2 GHz bands). The rig still works on NBFM voice but the 1st IF in the 1.2 GHz is tapped with an 18pf cap and routed to an "F" connector on the back. I then use a slightly modified channel 3 demod unit from PC Electronics (modified for crystal control and receive on 54.8 MHz video carrier). I tune my radio to the aural frequency to receive ATV.



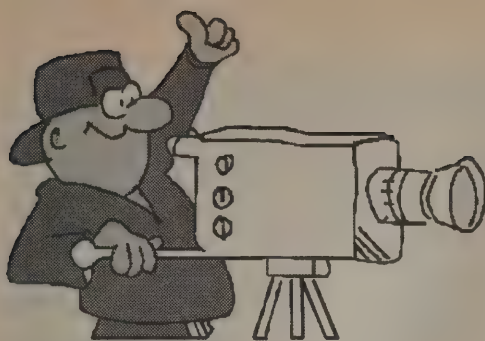
The transmitter is modified by taking the low power position to turn on an ATV modulator and 4.5 MHz audio subcarrier for ATV. The trick is to add a relay so in the ATV mode pin 2 on the power brick (driver collector supply) is taken off the APC circuit and connected to the Video modulator output. Set the low power pot for 6 watts average power out (peak sync is about 12 watts). The APC circuit still drives the previous pre-driver RF power chip so very little difference in power out is noted with or without video applied. The large electrolytic cap in the APC circuit keeps the APC from following the modulation.

The radio's control head is custom built in to the console so the install looks like it came from the factory. Pacific Stereo in Riverside, CA has a complete shop to fabricate custom interior coach assemblies. It cost a few hundred dollars for the custom work but makes the install look fully factory built.

ATVQ







# Harlan Technologies

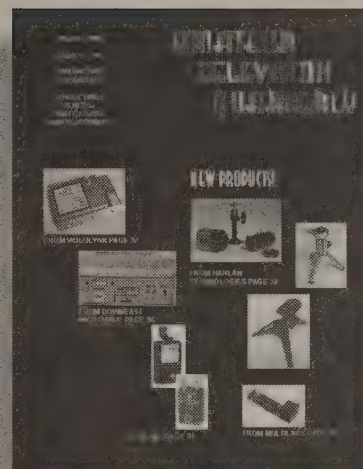
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ATV Secrets is a great place to start your ATV adventure! Volume I has 64 pages, tightly packed with information covering all aspects of getting started, where to find activity, equipment, how to DX, and answers frequently asked questions about power, antennas, vestigial sideband operation and more. Everything the beginner in ATV needs!

Volume II is a mammoth book with 292 pages of technical material. More than 40 authors present over 90 technical projects and theory topics to fully acquaint anyone from novice to expert in the how and what of TV, video, and ham TV. Divided into 11 chapters, the book presents tested projects for all areas of interest in ham TV including antennas, amplifiers, repeaters, receivers, transmitters, video accessories, and more!

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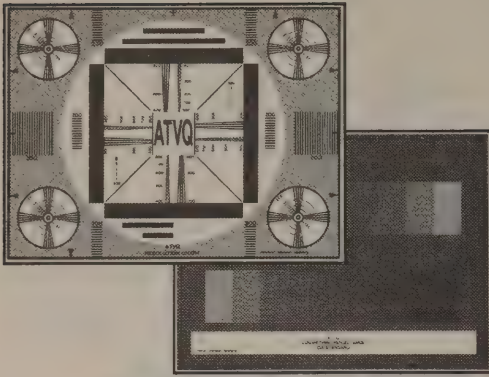
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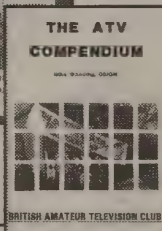
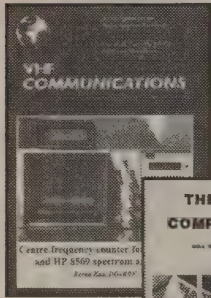
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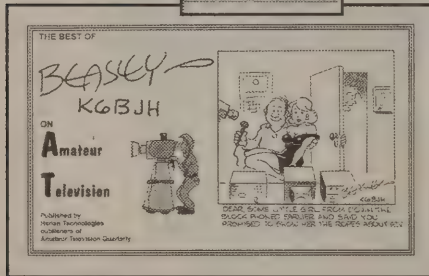
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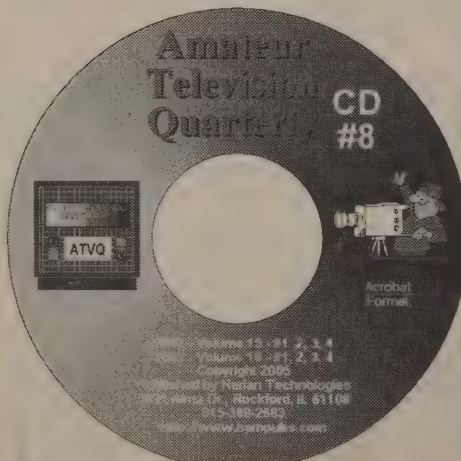
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With Varifocal Lens (6-15 mm - f1.4) and Stand!

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Sharp 1/4" CCD

NTSC

420 Line

1.0 Lux - F1.2

1 Vp-p 75 Ohm

Auto White Balance

S/N Ratio - More than 46 db

Electronic Shutter - 1/60-1/1000,000 Sec

Lens - C/CS Mount - 6-15 mm - f1.4

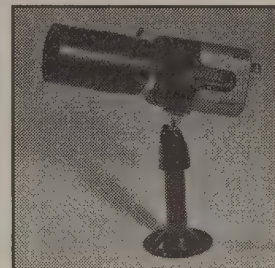
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Power supply and cables not included.

Complete package Only

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Color CCTV Camera - DV-4400CDN

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NTSC

420 Line

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1 Vp-p 75 Ohm

Auto White Balance

S/N Ratio - More than 46 db

Electronic Shutter - 1/60-1/1000,000 Sec

Lens - C/CS Mount - 6-15 mm - f1.4

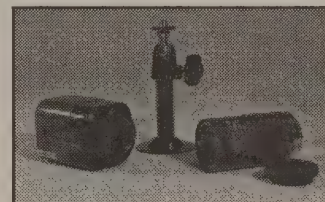
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Sharp 1/3" CCD

NTSC - 420 Line

1.0 Lux - 1 Vp-p 75 Ω

Auto White Balance

S/N Ratio - More than 46 db

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1.0 Lux - 1 Vp-p 75 Ω

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S/N Ratio - More than 46 db

Electronic Shutter - 1/50-1/100,000 Sec

3.6 mm board lens

Power - 12V±10% DC - 100 ma.

Small size - 34x34 mm

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### Water-Proof Color Camera

Color CCTV Camera - DV-262CW

Sharp 1/3" CCD

NTSC

420 Line

1.0 Lux

1 Vp-p 75 Ω

Auto White Balance

S/N Ratio - More than 46 db

Electronic Shutter - 1/50-1/100,000 Sec

6.0 mm - F1.2 lens

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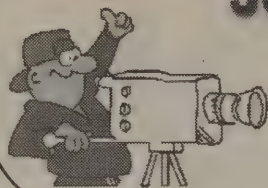




# WB6ATN

## John Ruckert

ATV Network  
East Hollywood



Quantity prices available!

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<http://www.hampubs.com>

Total	
If in Illinois add tax 7.25% (No tax on name tags or subscriptions)	
Shipping	
Final Total	

Name \_\_\_\_\_ Ham Call \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_ Country \_\_\_\_\_

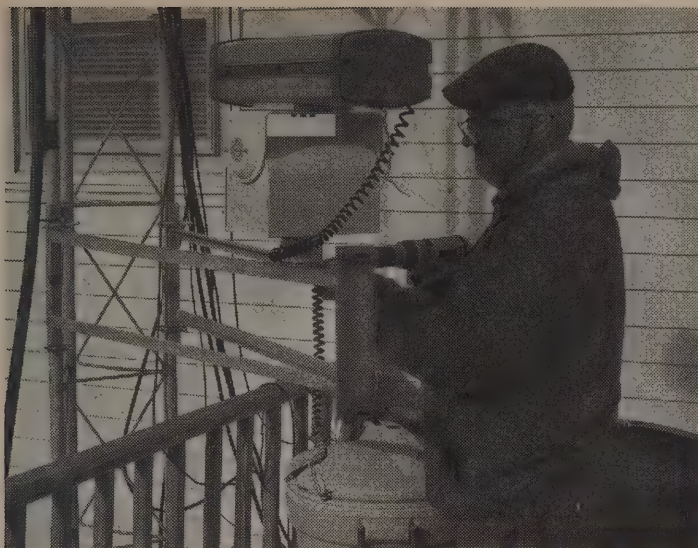
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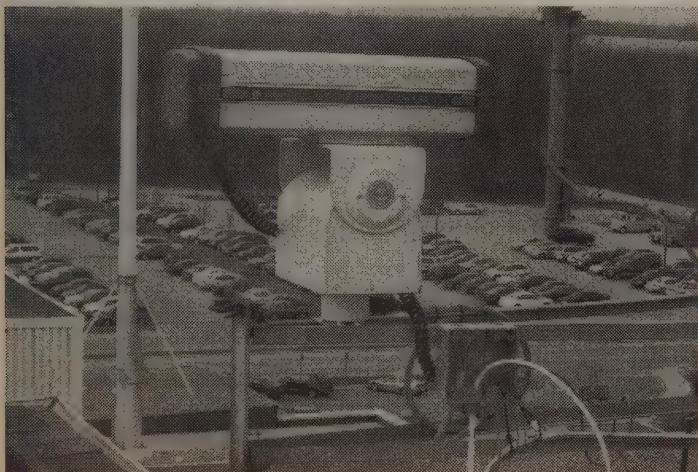


### KC9ATR checking the mounting arrangement before transporting to the repeater site

Having our ATV repeater up and running, the thoughts of what can we do next came about. It is always fun to do things and add toys to the repeater. The repeater site is at St. Anthony Hospital with the antennas on the tallest part of the structure, and has a nice view of the city. It would be nice to have a camera to use for weather events, watch traffic on East State Street, or just enjoy the view.

### Lens

It all started when a lens was announced for sale through one of the ATV email lists. I did not jump on it right away due to other things going on. But some time later sent an email to see if it was still available, and it was. The lens was a Canon TV Zoom Lens, model J6x11R, 11-70mm, using it with a



Camera mounted with interface box



Dan, KC9ATR installing the pan/tilt system

2/3" CCD, 1:1.4. The 11-70mm lens becomes more of a telephoto since our lens has a 1/3" CCD. Information that came with it said it ran from 12 volts with a common lead and one wire each to the zoom, focus and iris. Reversing voltage to each of the items would reverse direction. The 12 volts seemed to change each of these items very rapidly. Dan, KC9ATR, suggested that he had used 6 volts on 12 volt lenses before so they would change their settings more slowly, making it easier to control.

## Adding A TowerCam To Your ATV Repeater

By Gene Harlan, WB9MMM  
Email: [ATVQ@hampubs.com](mailto:ATVQ@hampubs.com)  
5931 Alma Dr.  
Rockford, IL 61108

### Control of Zoom and Focus

So, now we had to figure out how to control everything. The Intuitive Circuits DTMF-8 decoder board with eight relays was chosen for the remote control of the pan/tilt, zoom, and focus. As I stated above, there are four wires to the lens, common, zoom, focus, and

iris. Since the DTMF board has eight relays, we started by discussing what we would control and how. The pan/tilt needed four of those relays for left, right, up and down. That left four relays to change zoom in/out, focus in/out and iris open/closed - but that would take six relays. We decided that since the CCD had automatic light control, we would leave the iris wide open and let the camera do the adjusting for the light.

So we now had four relays to work with. The schematic labeled ZOOM/FOCUS CONTROL page 2 shows how this was handled.

The easy part was the DTMF 1 and 5 relays each being used to close relay 1 and relay 2 respectively, one to the ZOOM motor and one to the FOCUS motor. That will make the motors traverse in one direction. But they also need to be reversed.

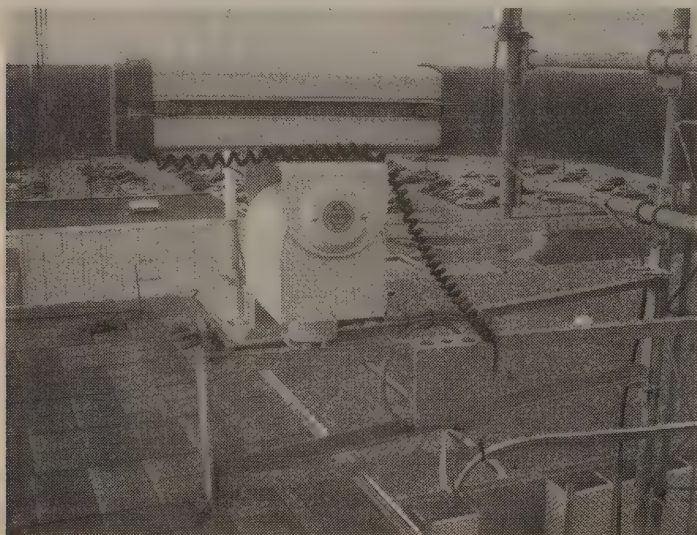
Relay R3's job is to reverse the voltage to control the direction of the DC motors in the lens. Using two diodes from the input





**Lots of wire to connect!**

of relay DTMF 3 and 7, the relay closing will close both the relay R3, but also relay R1 for DTMF 3 or relay R2 for DTMF 7. The relays that I used were 5 volt relays so I used a 5 volt regulator, LM340L-5 for the relays and the motor control. At 5 volts, the motors in the lens move a lot slower than they did at 12 volts. I have another lens at home and might even see what 3 volts will do for a possible future change.

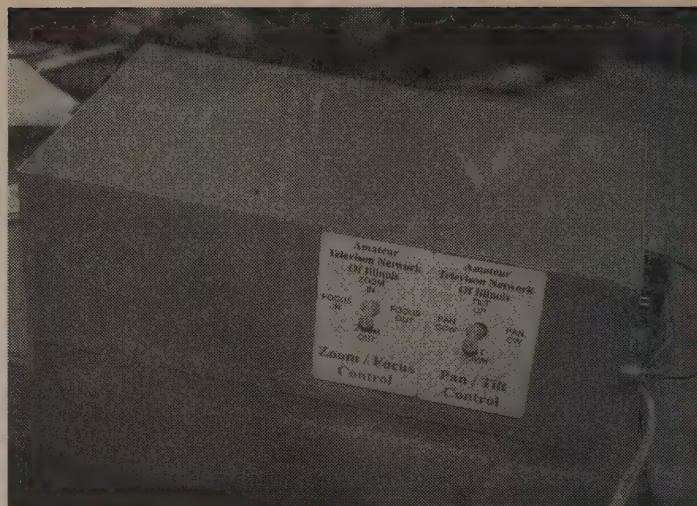


**Camera all buttoned up**

## Non-Control of Iris

Since we only had 8 DTMF relays, the iris did not get control. For the moment we are leaving it wide open, but we did run wires into the repeater room so we can experiment and maybe come up with control ideas in the future.

The back of the camera, one of the cameras that we sell - the DV-4400CDN, has a place for an iris control voltage for lenses that can use it. Unfortunately, the lens we are using is not controlled like most CCD camera lenses. The voltage coming out the back of the camera goes from 0 to 5 volts and does not go

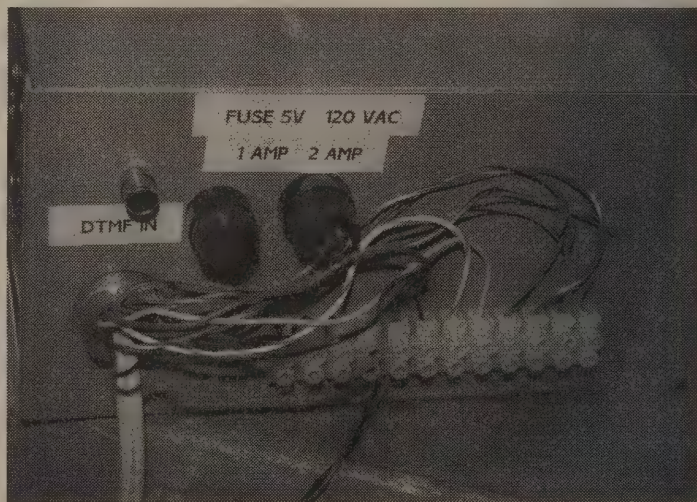


**Front of control box - note joystick controls**

positive and negative as needed by ours. Right now I am thinking that this will be best controlled by adding another DTMF control board someday so we can control it manually.

## Control of Pan/Tilt

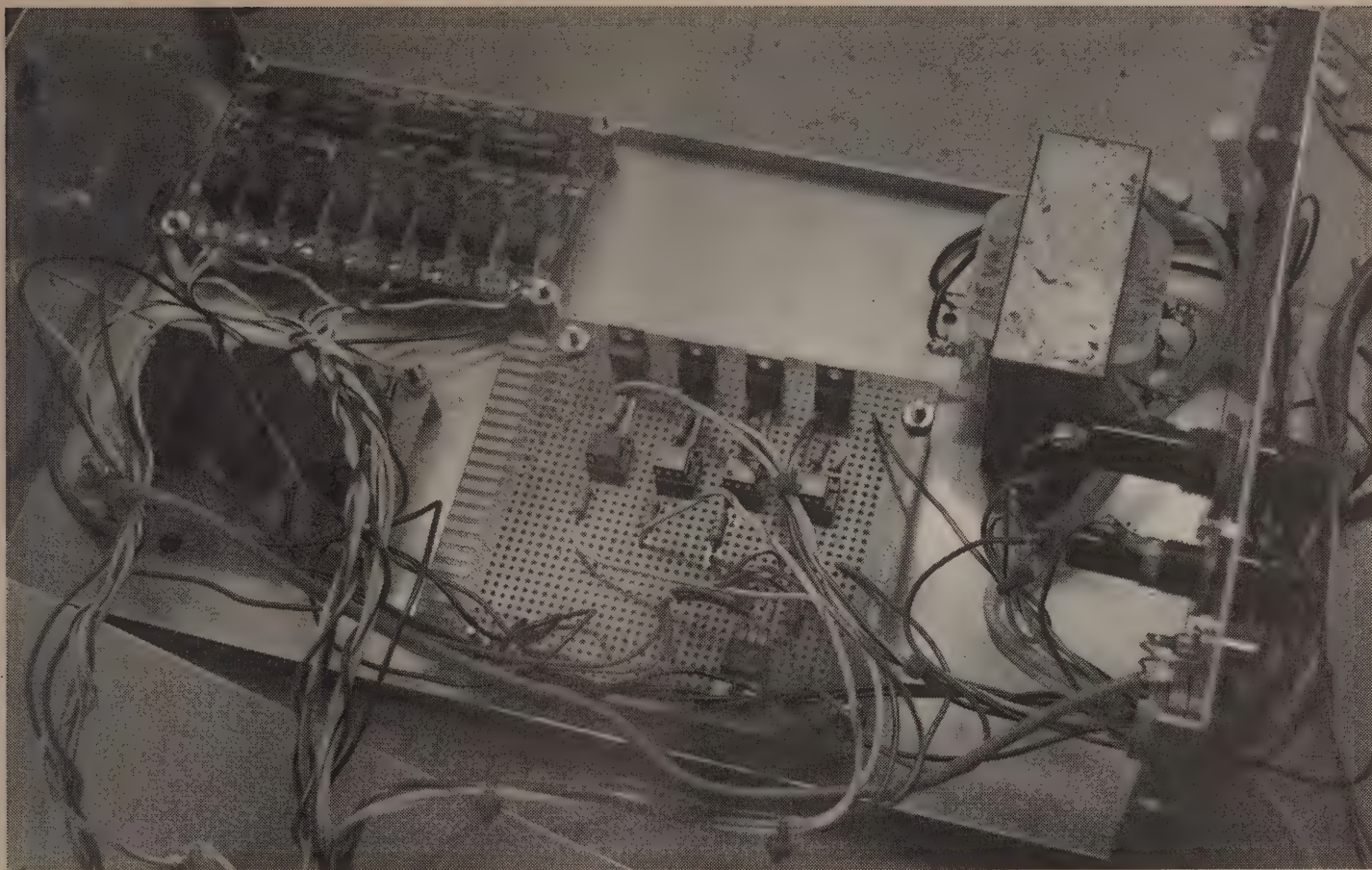
OK, now for the pan/tilt control. The one we bought at a ham-fest was the Pelco570-24P which uses 24 VAC. I considered using relays for this as well, but with 24 VAC at around one amp, I could see burning up the contacts over time. So I decided to use optoisolators and triacs. The triacs are rated at 40 amps (a big overkill), but I already had them so the price was right. The pan/tilt has an AC common plus the four wires for left, right, up and down. The triacs operate the four controls as shown on the second schematic labeled Pan/Tilt Control page 1.



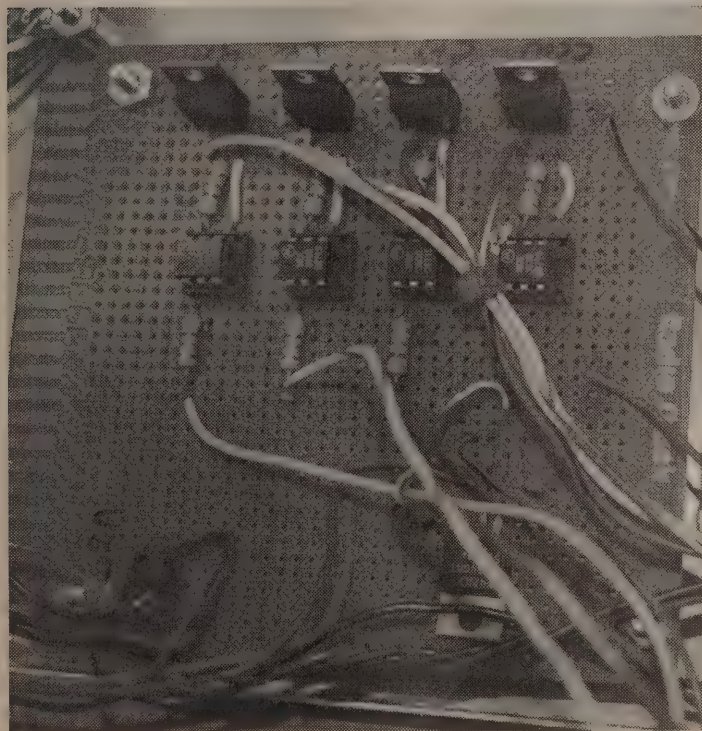
**Wire connections to roof**

The relay in the Intuitive DTMF board allows current to flow in the input side of the MOC3040 opto-isolator turning on the triac output allowing current to flow in the limit resistor (R5, 6, 7, or 8) and to the gate of the MAC224 triac.

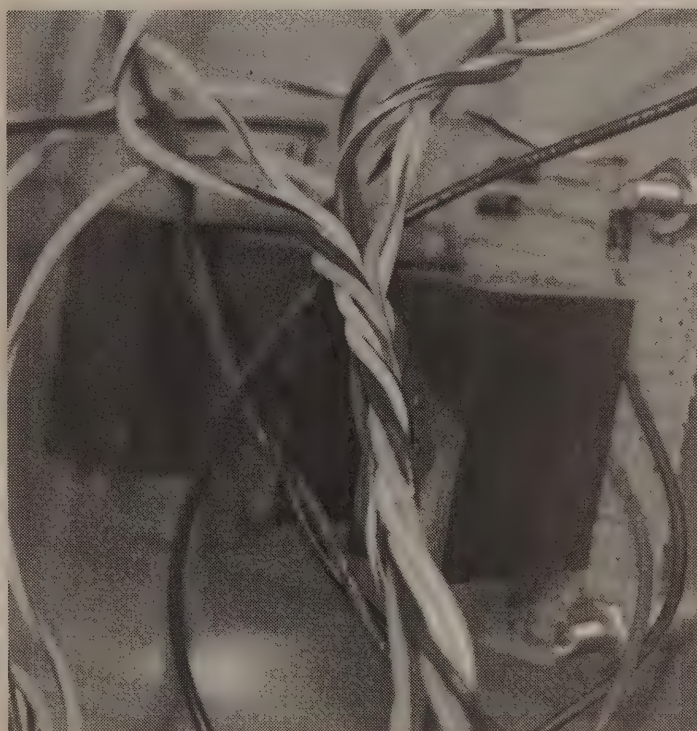




**Inside of control box showing Intuitive Circuits DTMF board, triac board, relay board and 24 VAC transformer**

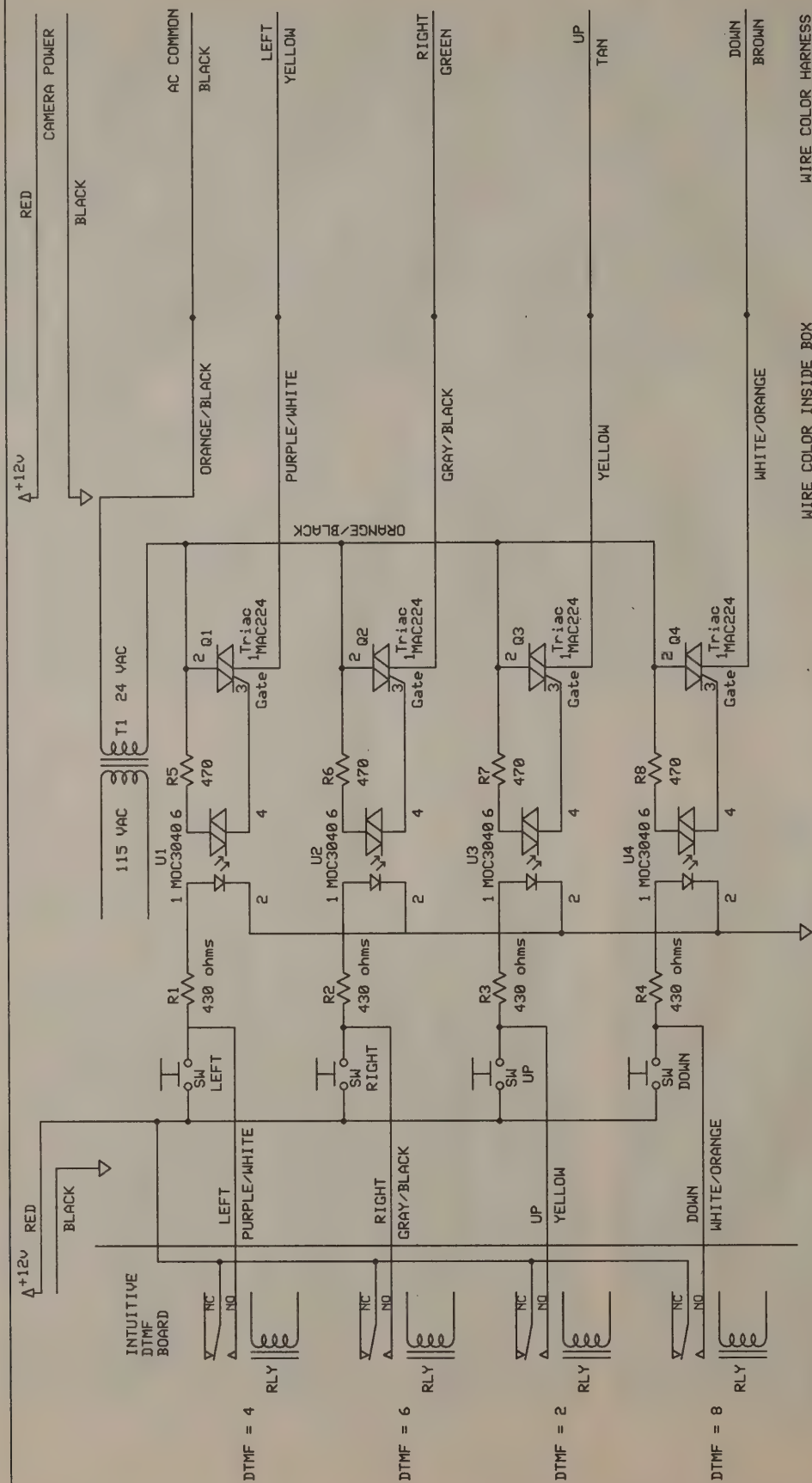


**Optoisolators and triacs**



**Relay board with diodes**





Amateur TV Network - Illinois

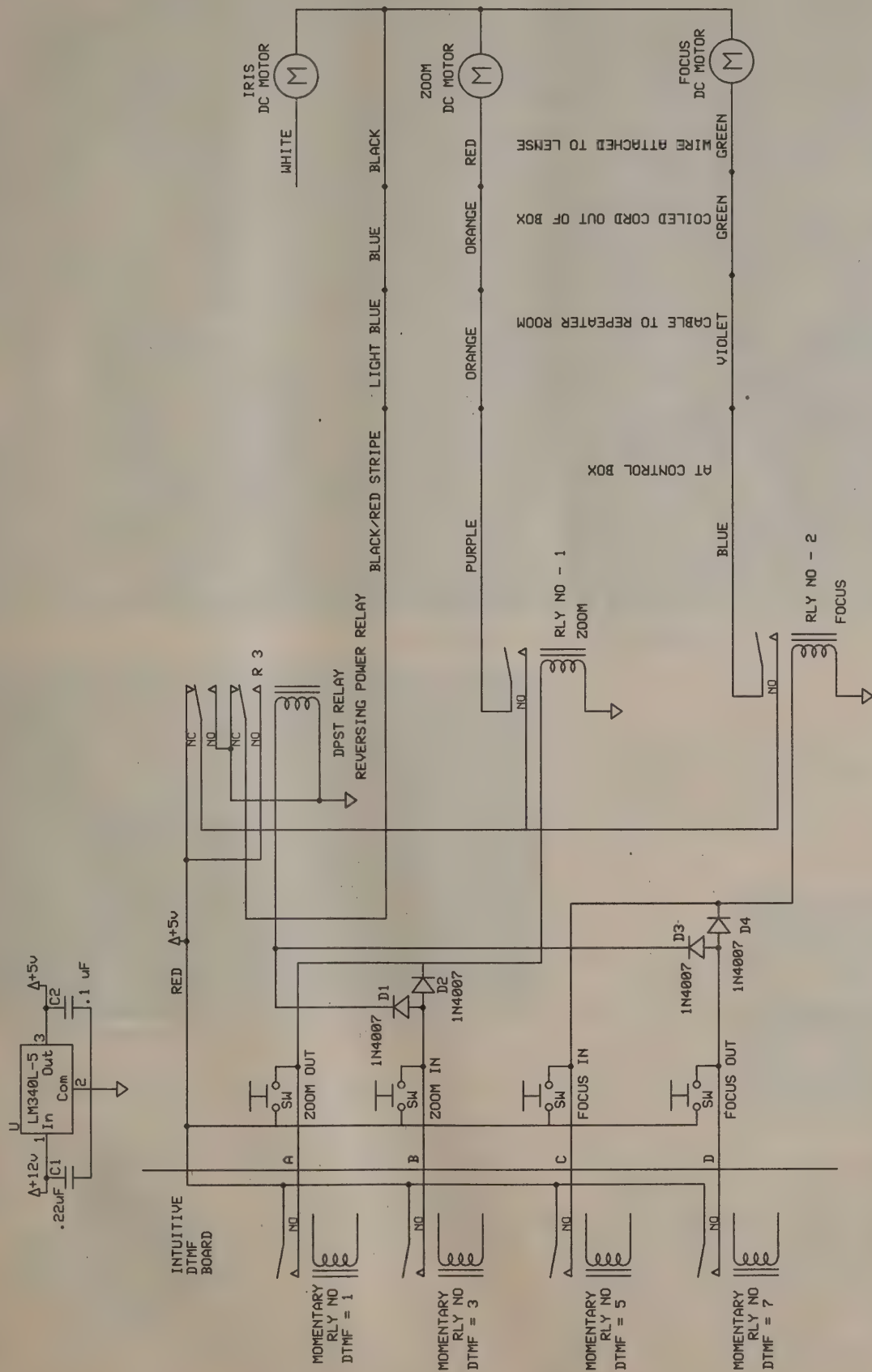
## Pan/Tilt Control

Rev 1.0  
11/3/2006

Gene Harlan - KB9MM

Page 1





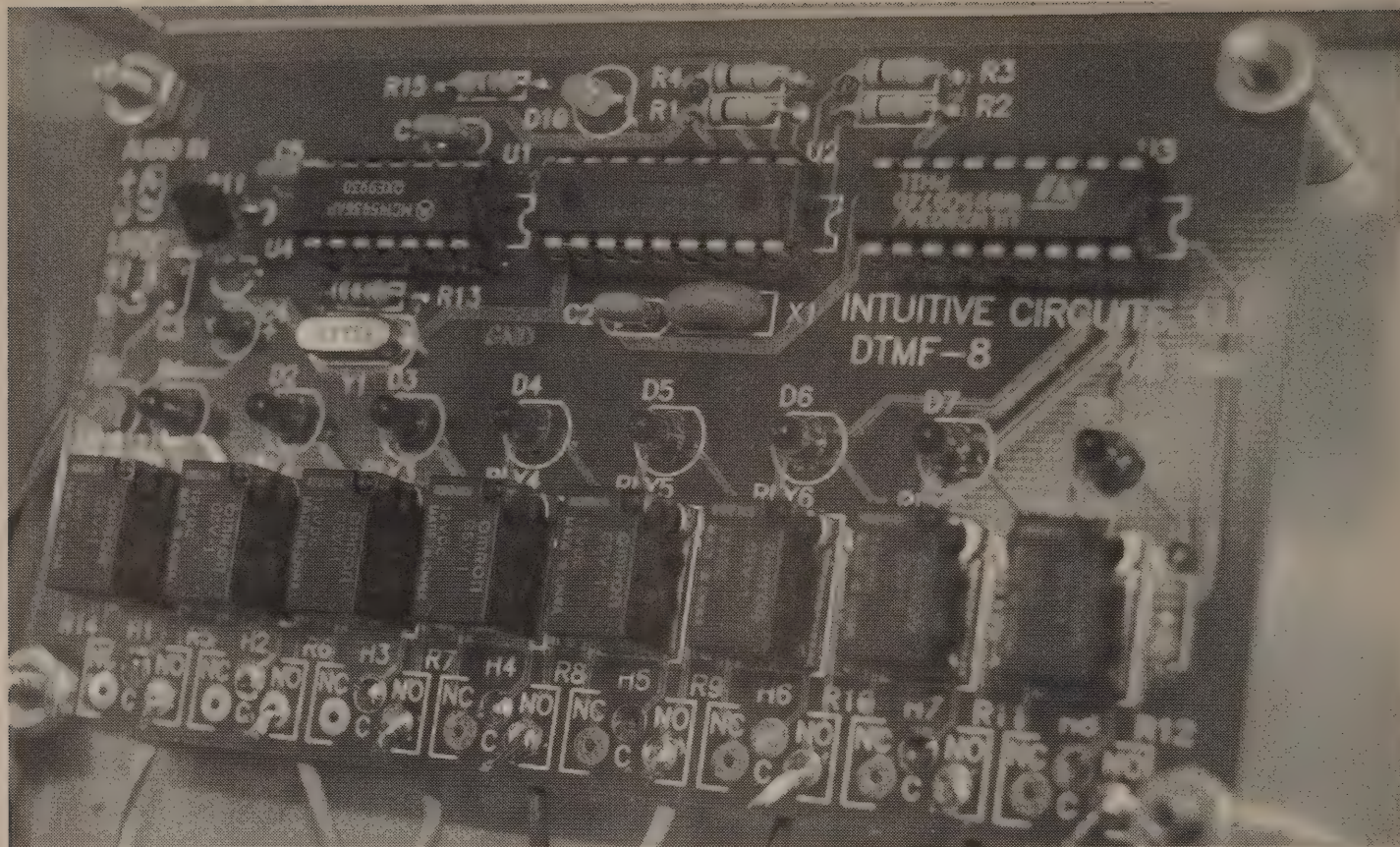
A = WHITE/ORANGE STRIPE  
 B = WHITE/BLACK STRIPE  
 C = YELLOW  
 D = BROWN

Amateur TV Network - Illinois

ZOOM/FOCUS CONTROL

Gene Harlan - W89MM Rev 1.0 11/3/2006 Page 2





Intuitive Circuits DTMF-8

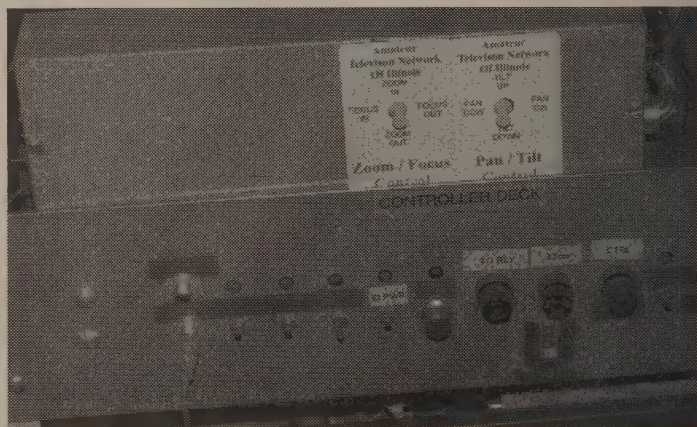
## Camera

As mentioned above, the camera we used is the DV-4400CDN that we sell. It works quite well day and night as it is supposed to. It switches from color to black & white when it gets down to around 1 lux and adjusts to light conditions very well without the iris being controlled.

## Control at the Repeater Site

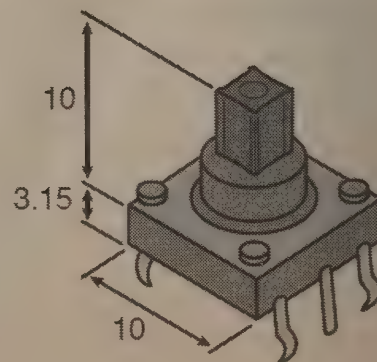
On both schematics you will notice that there is a switch in each line as well as the relay. We wanted to be able to control the pan/tilt unit from the control box without using DTMF. What we used is a small joystick control made by ALPS - p/n SKQU-CAA010 (Mouser p/n 688-SKQUCA \$2.70 in single quantities). This control also has a center push switch, but I have not thought of a use for that yet.

So another part of the repeater is in place. We will see how useful it is this spring and summer with the weather watches that we will have. Already used it for a snow storm that we had. Could not see off the roof it was snowing so hard! Still was fun. And New Years Eve, we watched some illegal fireworks going up above the trees at midnight. And the hospital has a helicopter that we can watch take off and land. In any case, I am sure it will be a fun part of the repeater system.



Pan/tilt system installed at repeater site

ALPS  
JoyStick





# To AC-Couple or Not to AC-Couple? That Is the Question!

Used with permission: Dallas/Maxim  
<http://www.maxim-ic.com>

This article explains the historic, technical, and economic reasons for choosing either an AC- or a DC-coupled video output. Maxim's DirectDrive™ video technology, which has the characteristics of an AC-coupled connection but the simplicity of a DC-coupled connection, is introduced. Using this information, a design engineer can decide better which style of video output to use in future projects.

## Introduction

For analog video circuits, the question of whether or not to design an AC-coupled output depends as much on company policy and industry standards as technology and cost. An AC-coupled output includes a series capacitor (Figure 1a), while a DC coupled output does not (Figure 1b). A designer new to video output circuits may find such a choice confusing because adding a capacitor to the output path increases cost, requires space, and distorts the video signal. However, the choice may have already been made due to historical, technical, or economic reasons.

## AC-Coupled vs. DC-Coupled Outputs

Figure 1a<sup>1</sup> shows the input and output waveforms for an AC-coupled output. Notice how the output waveform “tilts” up and “tilts” down with respect to the input waveform. Hence, the name of this kind of field time distortion is “field tilt.” The oscilloscope trace in Figure 1b<sup>2</sup> shows a DC-coupled output. In this case, notice that there is no field tilt. The NTSC video test signal used is named “Regulate.” Figure 2a shows what the white portion of the test signal looks like on a video monitor. Figure 2b shows what the black portion of the test signal looks like on a video monitor. The Regulate video test signal draws a white border on the edge of the screen during both the white portion and the black portion.

## Historical Use of AC-Coupling

Given the drawbacks of AC-coupling, why did it ever get used? The simple answer is protection. Figure 3 shows a simple video-output circuit that might have been created before integrated circuits were widely used. The capacitor prevents the NPN transistor from damaging itself in case the output connector is shorted to ground or a supply voltage.

Contemporary integrated video amplifiers have robust short-circuit protection circuitry so that they are not damaged in the event of a short. Nonetheless, the use of the

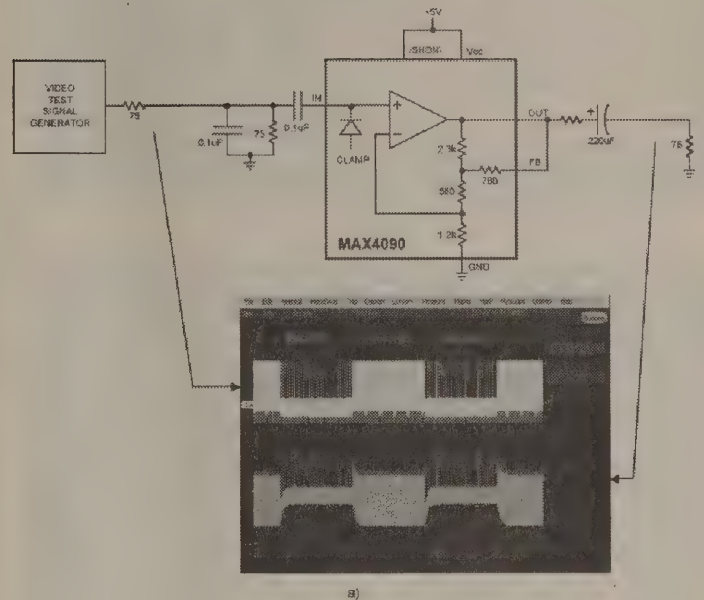


Figure 1a. AC-coupled output connection.

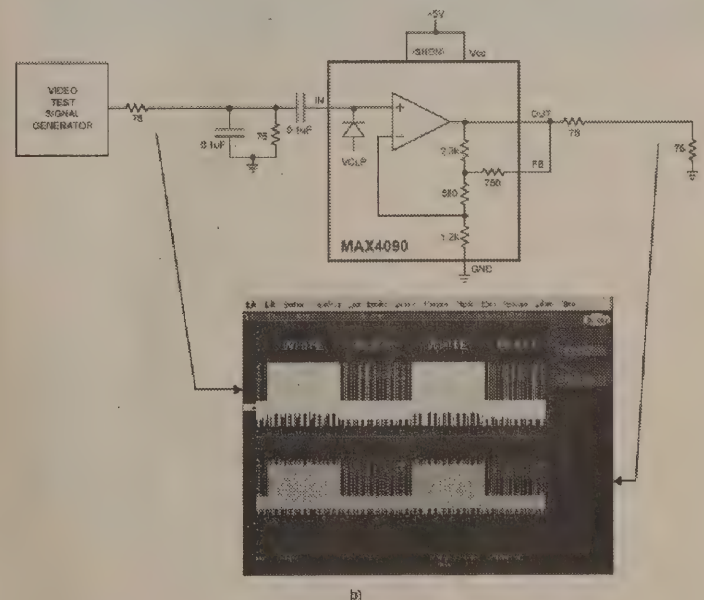


Figure 1b. DC-coupled output connection.

capacitor has become entrenched in some companies, especially those with a long history of making video equipment. Design engineers may be told that they must add a capacitor to comply with company policy.

In addition, industry standards can implicitly force the design engineer to use a capacitor. The Japan Electronics Industry Trade Association (JEITA) has a specification that requires that the voltage



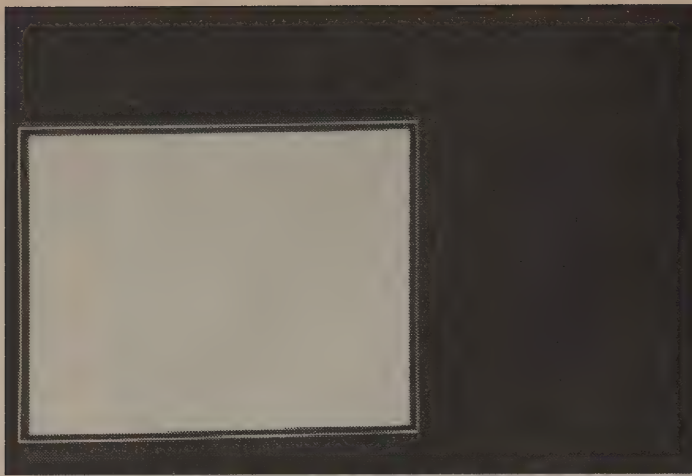


Figure 2a. White screen of Regulate video test signal.

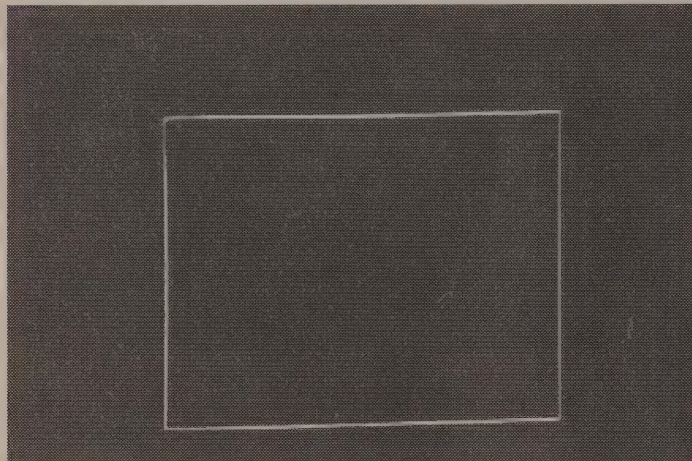
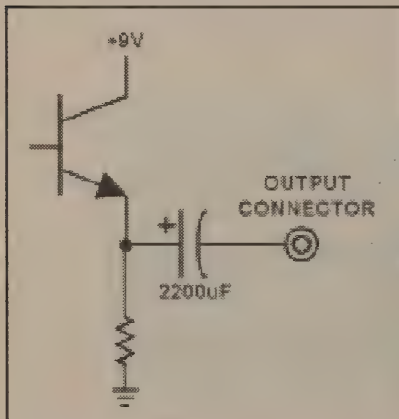


Figure 2b. Black screen of Regulate video test signal.

Figure 3. NPN emitter follower driving video output.



magnitude must be less than 100mV on an inactive video output connector (Figure 3). If the normal DC bias at the NPN emitter is 4V, then the output connector would also be approximately 4V if the capacitor and bleed resistor were not present. The easiest way to meet the JEITA specification is to add a capacitor and bleed resistor to ground.

## Technical Concerns

One of the concerns about AC-coupling is that the capacitor is usually large—220µF or higher. The reason is that the frequency of the pole formed by the capacitor and 150 load (the total resistance of the back termination resistor and the input termination resistor) should be significantly less than the frame rate of either 25Hz or 30Hz. A 220µF capacitor forms a pole at 5Hz, which is barely adequate. Broadcast equipment typically has capacitors in

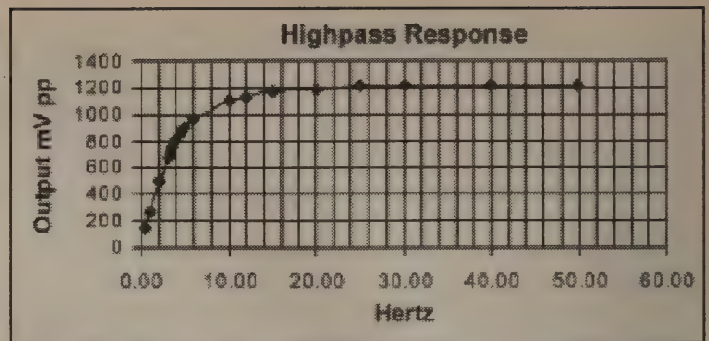


Figure 4. Frequency response of AC-coupled video connection with 220µF capacitor.

the 2200µF range. Figure 4 shows the highpass response of an AC-coupled output connection with a 220µF capacitor.

With the advent of small, portable devices that have video outputs, using a large, AC-coupling capacitor becomes prohibitive, primarily for space and cost reasons. SAG compensation, shown in Figure 5, can reduce space and cost while maintaining AC-coupling. The single large capacitor of the standard connection is replaced by two, smaller capacitors. A technical analysis of SAG compensation is beyond the scope of this article, but a short, intuitive explanation can be given. The problem with a single, AC-coupling capacitor is that the signal is attenuated at frequencies below the pole frequency—the smaller the capacitor, the higher the pole frequency. SAG compensation boosts the low-frequency response in order to compensate for the low-frequency attenuation (Figure 5). At low frequencies, the capacitors can be treated as opens. The low-frequency gain is approximately 6. At high frequencies, the capacitors are essentially shorts, and the high-frequency gain is 2.

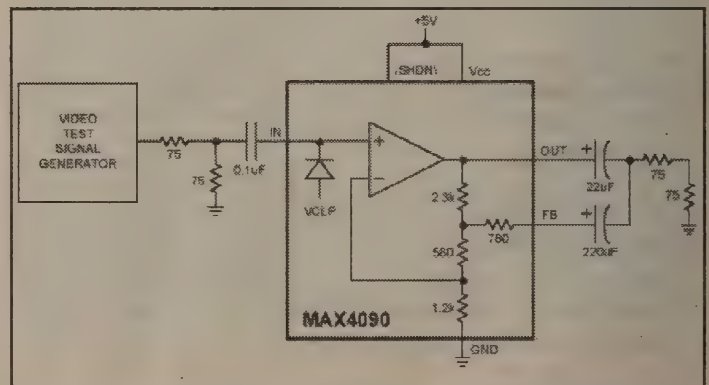
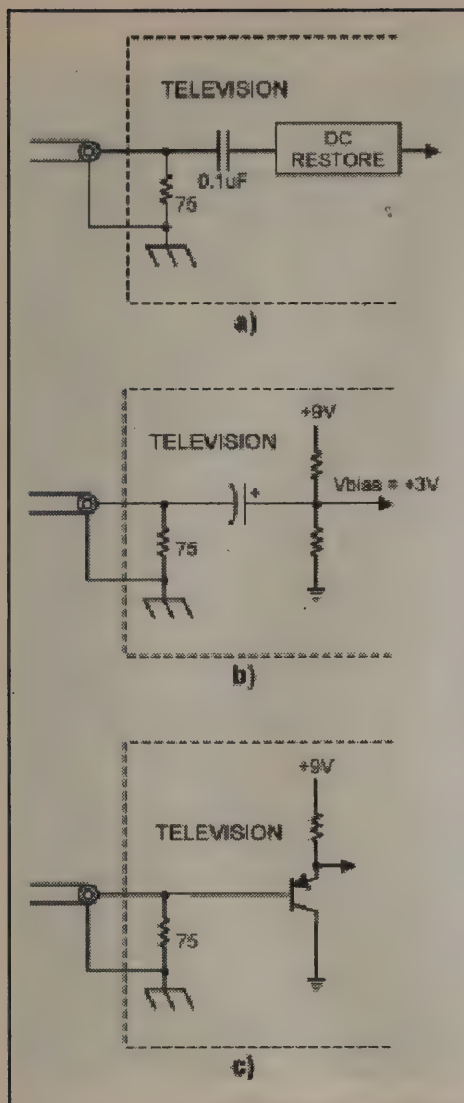


Figure 5. Video driver with SAG compensation.

In the consumer electronics industry, the pressure to reduce cost is intense, and for small devices, the pressure to miniaturize is just as intense. Companies, even some with a long history of designing video equipment, are now opting for DC-coupled video connections (Figure 1b). The main difference to note with a DC-coupled output is that the signal has a positive DC bias due to the fact that most systems have eliminated negative supplies. In order for the amplifier to remain in a linear mode of operation, the output signal must be biased between ground and the positive supply.





**Figure 6. a) Modern TV input stage, b) polarized capacitor c) PNP emitter follower in input stage.**

video signal is too high, then the polarized capacitor could be damaged. This input stage might have problems with a signal from a DC-coupled source.

**Figure 6c** shows an input stage that uses a PNP emitter follower. If the input signal is too negative, then the PNP emitter follower might saturate. Therefore, a DC-coupled video source might saturate the PNP emitter follower, especially if the local ground of the source is lower than the local ground of the receiver.

The problem with televisions is that there has never been a commonly accepted way of designing the input stage. Some models of the numerous televisions designed over the years have marginal input stages that could have problems with either AC- or DC-coupled sources. It is not possible to maintain universal compatibility when there are so many different kinds of receiving equipment. Most low-end video sources, which represent the greatest volume of transmitting equipment, tend to use DC-coupled outputs for cost reasons.

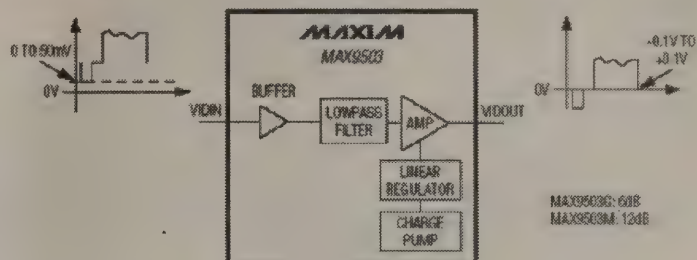
Design engineers who are contemplating a switch from an AC-coupled output to a DC-coupled output are concerned with compatibility. The vast majority of equipment is compatible with either style, but there is still a small percentage that is incompatible with an AC-coupled output, and yet another small percentage that is incompatible with DC-coupled outputs.

**Figure 6a** shows the input stage for a modern television. The video signal is AC-coupled into a DC restoration circuit: hence, the input video signal can have any DC bias. This input circuit is compatible with both AC- and DC-coupled video sources.

**Figure 6b** shows the input stage that uses a polarized capacitor. If the DC bias of the incoming

## DirectDrive Solution

For those design engineers who still want to include an AC-coupled video output, Maxim offers DirectDrive technology, which eliminates the need for large output-coupling capacitors. The MAX9503 is the first Maxim part to incorporate DirectDrive technology for video signals (see **Figure 7**).



**Figure 7. MAX9503 block diagram and representative input and output waveforms.**

The MAX9503 filters and amplifies standard-definition video signals. The input of the MAX9503 can be directly connected to the output of a video digital-to-analog converter (DAC). An internal reconstruction filter smooths the steps and reduces the spikes on the video signal from the DAC. The MAX9503 level shifts the video signal to a lower voltage such that the blank level is approximately at ground at the output. DirectDrive requires an integrated charge pump and a linear regulator to create a clean negative power supply to drive the sync pulse below ground. The charge pump injects so little noise into the video output that the picture is seemingly flawless.

**Figure 8** shows a Regulate video test signal applied to the MAX9503. Notice how the blank level of the output waveform is held near ground and that there is no field time distortion, in contrast to the normal AC-coupled waveform shown in **Figure 1a**. The Regulate test signal at the MAX9503 output maintains a much more well-defined output voltage range than that from an AC-coupled connection.

One of the reasons to use an AC-coupled video output is for protection against shorts to ground and the supply voltage. The MAX9503 typically operates from a 3.3V supply. The MAX9503 application circuit includes a 75 back-termination resistor that limits short-circuit current if an external short is applied to the video output. In addition, the MAX9503 features internal output short-circuit protection to prevent device damage in prototyping and applications where the amplifier output can be directly shorted. Hence, the MAX9503 is robust in the face of most common fault conditions.

The major benefit of DirectDrive is that for the addition of just two small, 1uF capacitors for the charge-pump circuit, the design engineer can eliminate the single, large, output-coupling capacitor in a standard AC-coupled video output or two medium-size, output coupling capacitors in a SAG network. Output video quality is improved because field-time distortion is eliminated.



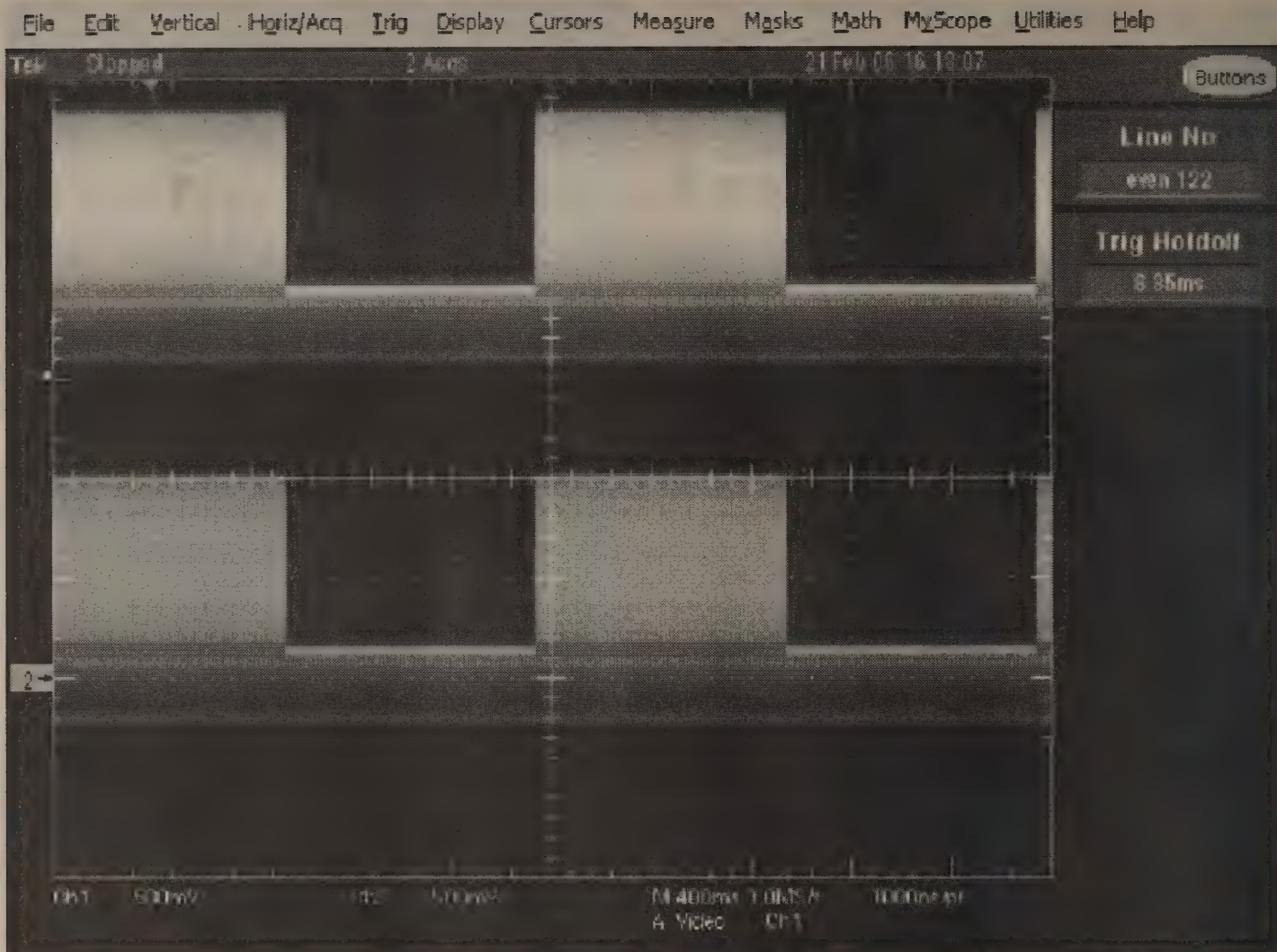


Figure 8. Regulate video test signal applied to the MAX9503—input waveform is on top, output waveform is on the bottom.

## Notes

1 The 0.1 $\mu$ F capacitor across the 75 input-termination resistor to ground filters out higher frequencies in the video waveform, removing aliasing in the black portion of the video test signal. The 400ms time scale of the oscilloscope shot is very long compared to a horizontal line time ( $\sim 64\mu$ s). Without the 0.1 $\mu$ F capacitor, the aliasing during the black portion of the video test signal would make the black portion of the input signal nearly indistinguishable from the white portion. The black portion of the output signal would be filled in like the white portion.

2 Just as in Figure 1a, there is a 0.1 $\mu$ F capacitor across the 75 input-termination resistor to ground for the same reasons. Without the 0.1 $\mu$ F capacitor, the aliasing during the black portion of the video test signal would make the black portion look the same as the white portion.

ATVQ

## Novices on HAM TV?

Are you aware of any HAM TV repeaters that INPUT on 1277.25 or 1289.25 MHz? Do you know of any SIMPLEX operations on those frequencies? Just curious to know if there ARE any novice licensees running HAM TV.

Bil - K1ATV - [wmunsil@cox.net](mailto:wmunsil@cox.net) - Mesa AZ

ATVQ

## K9ATN To Live Again

The new ATV repeater will feature a 421.25 VSB output (horizontal) about 800 watts TPO, and about 6 dB antenna gain, with 500' 1 5/8 coax. The receive side will have a multiband vertical input with AM and FM receivers, with some combination of 900/1200/2.4 gig depending on antenna. As before, transmit antenna is at 450 feet, and receive will be at 550 feet. Same location as the former AA9XW repeater in NW Indiana. Potential users are welcome to suggest receive frequencies.

Henry AA9XW

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## Repeater Summary for 2006 ATN-CA:

The California Chapter of the Amateur TV Network has been busy this year putting up repeaters. We finished the repeater at Snow Peak above and northeast of Banning at 7915 feet elevation. The repeater covers Palm Springs, Indio, Yucca valley and portions of the San Bernardino Valley, A.K.A. Inland Empire. The output is 1241.25 MHz VSB with 434 MHz AM and 2441.5 MHz FM inputs. The repeater is linked to Santiago Peak.

The Mt. Wilson Repeater is at a new building location at the highest point on Mt. Wilson 5700 feet with antennas mounted at 200 ft. This brings the system 250 ft higher than the old site and the repeater is all new equipment and antennas, also new is the 5 GHz microwave link to Santiago Peak. Special thanks to Merv, KO6E, for the donation for the expensive commercial microwave filter that allowed us to ride our 5 GHz link along on an existing 10 ft HP dish on the 6/7 GHz ICR band. Output is 1241.25 MHz and input is 434 MHz AM and 2441.5 MHz FM. Coverage is the Los Angeles area.

A new repeater at Point Loma near San Diego was built with the donations and help of Robert, KA4JSR. The repeater covers the coastal San Diego area. The output is 1277.25 MHz VSB and inputs on 434 MHz AM and 2441.5 MHz FM. The repeater is linked to Santiago Peak one way and the return link is almost finished.

Oat Mountain has a new amplifier 250 watts on 919.25 MHz out to help get over the part 15 QRM. It really helps to have power in this band. The input is 434 MHz AM and 2441.5 MHz and should be operational by the time you read this information. Bryon, N6IFU, has been busy getting many new ATVers on the air around Simi Valley and other nearby areas. He has been the most successful person I know who can get hams on ATV. Last summer at his open house for ATV he got 4 new members for us and one more joined soon after the open house.

Blueridge Mountain has a new 5 GHz FM link from Santiago via my QTH to Blueridge replacing the old AM link. Works great. The link back to Santiago also via my QTH is on 2.4 GHz FM and still working well. Check out the coverage maps at [www.atn-tv.org](http://www.atn-tv.org) for coverage details. The repeater has a new larger power amplifier doubling the output power.

73s,  
Mike WA6SVT

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## Using Different Lenses On CCD Cameras

Due to my own findings trying different lenses on the cameras we sell and questions from a customer, I asked the manufacturer the following:



The cameras that I bought (DV-4100-C & DV-4400-CDN) work great with the supplied lens, but when I put my own "C" lens on it (I've tried several) the back focus is off. The only way to get it to work is to unscrew the lens 1-2 threads, but of course it won't stay there. I have seen this myself and a couple of customers have mentioned this as well. The "C" ring was installed and I still have to unscrew a couple of turns so the lens is loose. Is there something I can explain to my customers and/or is there a solution?

### Answer:

For our Micro standard camera, there is a screw on the camera body to fix & adjust the position of the ring as attached picture.

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# Grande Bleue 2006 A Big Success

By DJ9PE and OE5BDO Email: [bernd.beckman@gmx.net](mailto:bernd.beckman@gmx.net)

Translations: Klaus Kramer, DL4KCK Email: [DL4KCK@t-online.de](mailto:DL4KCK@t-online.de)

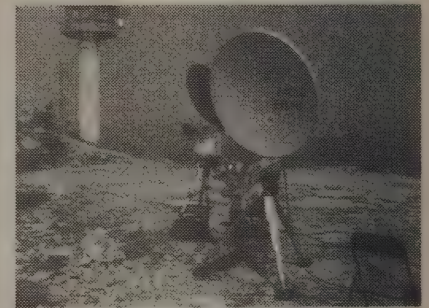
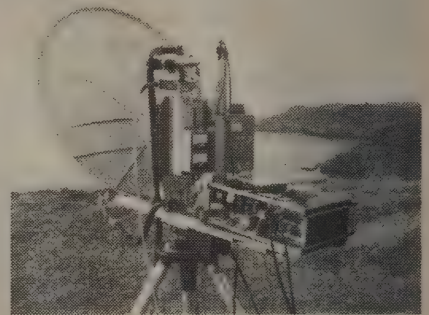
For more than 10 years some radio amateurs from countries around the western Mediterranean Sea have gathered in July to make ATV and SSB contacts on the microwave bands. Distance records have been broken almost every year. In 2006 stations from France, Italy, Malta, Spain, and for the first time Algeria took part besides a Swiss team under IS0/HB9IBC portable on the isle of Sardinia. In Northern Sardinia (JN40CT) HB9AZN and HB9RXV received several ATV repeaters over a distance of 300 to 500 km. Nearly every day contacts in ATV and DATV succeeded to EA3XU over 550 km and to F4CXQ over 350 km. Very nice video views were exchanged with TK/F5BUU on the isle of Corsica. A planned contact on 1255 MHz to Algeria with 7X2FB and 7X2RF failed because of interference by the local airfield radar.

The biggest success was an excellent contact in ATV and DATV on 10 GHz over 561 km to Malta (9H1), maybe a new record in digital ATV after a former 450 km success. This needed a suitable location for both stations. The Swiss team drove to the southern tip of Sardinia to a parking place about 60 m above sea level. Output power in DATV (QPSK, SR 7500, FEC 3/4) was 1.5 W, in FM-ATV 25 W into a 90 cm parabolic dish. The Malta team (9H1ES, 9H1VW, 9H1AK, 9H1LO, 9H1M, 9H5CZ) received the 10 GHz FM-ATV signal with a 1.2 m dish rather quickly after a talk back contact on 2 m. The DATV contact wasn't quite as easy, but after employment of a spectral analyzer the signal was found and a good video received. The DATV picture quality appeared superior to FM-ATV, HB9AZN was using MPEG encoder and QPSK exciter boards from the german AGAF development team. Other hf modules in his station were from Kuhne-electronic, ID-elektronik and Dirk Fischer (Germany). Several more ATV contacts were made from the sardinian south (JM49SD), for instance to

I8EMG (Italy). Details in french language are available under [www.swissatv.ch](http://www.swissatv.ch)

Authors: DJ9PE and OE5BDO after a report by HB9RXV

ATVQ





# Test And Modification Of A 6 Channel Video Amplifier

By J. Schaefer, DJ7RI

Translations: Klaus Kramer, DL4KCK Email: DL4KCK@t-online.de

www.agaf.de

This affordable commercial device is made for video distribution to 6 outputs, for instance to several flat-screens. For access to the new gain potentiometer P3 (picture "Bild 1", right hand above) we have to drill a hole into the casing. The device is delivered with a separate power cable including circuit breaker. Parameters seem to verify a proper distribution: supply voltage 12 V DC, cinch sockets, input level 1 V p-p, output level variable 0,5 - 1,5 V p-p, power LED, casing 155x21x80 mm.

Video systems are using 75 ohm impedance which guarantees a loss free transfer even with using long cables. A video source with 75 ohm impedance will submit about 2 V p-p standard level without a load and about 1 V p-p across 75 ohm load impedance (voltage divider). To measure this you need a tee feeder at the oscilloscope input, and with a 75 ohm load resistor at the second input the test signal voltage should drop to half value. The original VA6000 has a much higher input impedance than needed and thus already reduces the colour subcarrier and overall sharpness using only 1,5 m cable length. It's output impedance is much lower than 75 ohm which is no fault but needs observation. The overall "gain" is only 0,7 as the involved cascaded emitter followers cannot realize more voltage gain. Only with very short input cables (20 cm) the standard output voltage of 1 V p-p at 75 ohm load is possible. The coupling capacitors have 220 uF, which is just acceptable, but 1000 uF would be better for a stable black level.

As I needed to use a longer input cable, I decided to modify the VA6000 input (losing any guarantee). The circuit diagram is

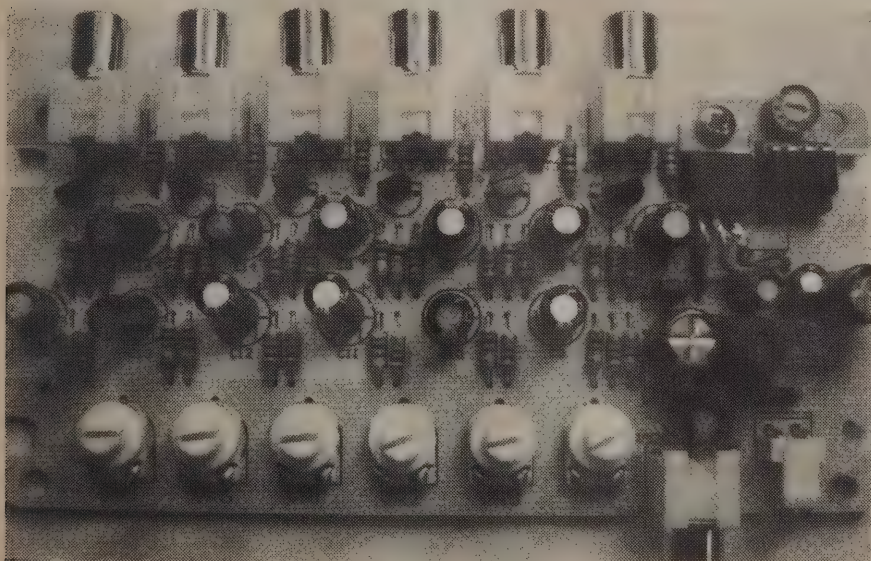


BILD 1

showing only channel 6, 1 - 5 is indicated above.

In order to mount a small amplifier IC NE592 on the VA6000 motherboard the voltage regulator 7809 had to move aside some millimeters (see photo "Bild 2"). Several circuit parts around the new IC were attached at the solder side (i.e. 75 ohm input load) or glued to the board (IC socket, potentiometer).

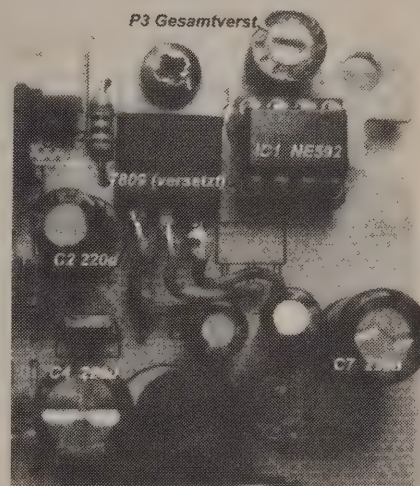


BILD 2

Testing the VA6000 output with an oscilloscope I noticed self-oscillation at around 80 MHz which demanded additional blocking capacitors (see diagram: "M2 0,1uF von + gegen GND"). The varnish had to be removed at casing points where screws attached the

motherboard. Finally 2 additional ground wires (see photo "Bild 3",

"Masseverbind.") suppressed any self-oscillation.

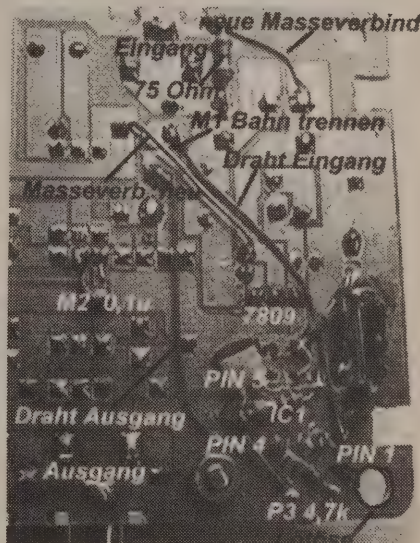
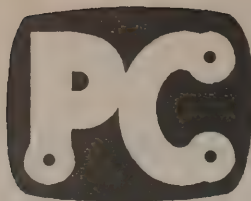


BILD 3

The video input track is interrupted and bridged by the input/output wires to the new NE592, see photo "Bild 3", "M1 Bahn trennen" and diagram "M1 (Leiterb. getrennt)". The output voltage 1 V p-p at 75 ohm load is adjusted with P3 near IC NE592, a fine adjustment of all outputs to equal values could be achieved better with lower "P1" values of around 2 k ohm instead of 10 k ohm. Power consumption is about 200 mA at 12 V DC.





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Email: Tom6org @ hamtv.com

Web site: http://www.hamtv.com



## ELECTRONICS Packaging the 1W ATV Transmitter w/Sound for R/C and Portable

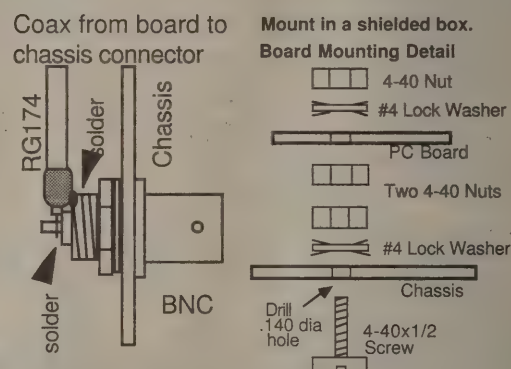
Putting the TXA5-RCb transmitter and FMA5-G sound boards together in a Hammond 1590BB die cast aluminum box (available plain or black) makes a small ATV rig for portable applications like our original "Kreepie Peepie" board did some years ago. For public service applications, a belt clip can be attached to the box or put in a belt pack pouch. For larger R/C vehicles that want to add sound to hear the change in engine loading during climbs and dives, balloons popping or wind noise, or to send back data like APRS on the audio subcarrier, this is the way to go. The weight is 12 oz, and current draw is 350 ma at 12V which conserves battery size and extends operating time compared to other ATV transmitters for the same DX.

Prewire the two boards as shown in the photograph below using the wire list. Different colored #22 hook up wire is used for easy circuit identification, but not necessary. A length of RG174 comes with the TXA5-RCb. Take care when soldering the coax to have no mechanical bends that could make the center melt through the dielectric to the shield. After soldering to the boards, check all connections, especially the coax, with an Ohm meter for shorts. All connections must be greater than 70 Ohms with respect to ground.

Make a copy of the drill drawing on the next page and prepare the chassis. Mount all the connectors and switch. Put the 4-40 screws in the 8 holes on the bottom with a lock washer and finger tighten the 2 spacer nuts. Mount the boards then tighten the screws after alignment by pressing down on the respective corner of the board. Then add the final lockwasher and nut. Connect all the wires to the jacks and switch as shown in the photo on the next page. Check for shorts once again. Connect to a good low SWR 50 ohm antenna and enjoy.

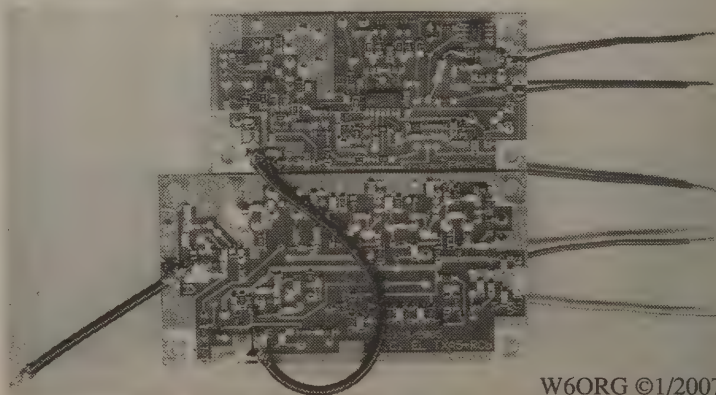
### Parts List:

ATV Transmitter Board	P.C. Elect.	TXA5-RCb
Sound Subcarrier Board	P.C. Elect.	FMA5-G
Hammond 1590BB	Mouser	546-1590BB
2 RCA Jacks A/V	Mouser	161-1052
Mini Mic Jack	Mouser	16PJ012
BNC Jack	Radio Shack	278-105
2.1mm DC Power Jack	Mouser	274-1563
2.1mm DC Power Plug	Radio Shack	274-1569
Toggle switch	Mouser ME	108-MS550K
4 100 pF disc caps	Mouser	140-CC502N101J
8 4-40x1/2 pan head screws, 24 nuts & 16 internal tooth lock washers		



### WireList:

Red 6" from DC Jack to DC Switch  
 Red 2.5" from FMA5+ to DC Switch  
 Red 5" from TXA5-RCb+ to DC Switch  
 Yellow 2" from TXA5-RCb Vpad to Video Jack  
 Blue 2" from FMA5 M pad to Mic Jack  
 Brown 2" from FMA5 L pad to Line Audio Jack  
 4" RG-174 coax from FMA5 to TXA5-RCb  
 2" RG-174 coax from TXA5-RCb to BNC Jack  
 Bypass Mic, Line, Video and Power jacks with 100 pF disc ceramics - short leads.



W6ORG ©1/2007





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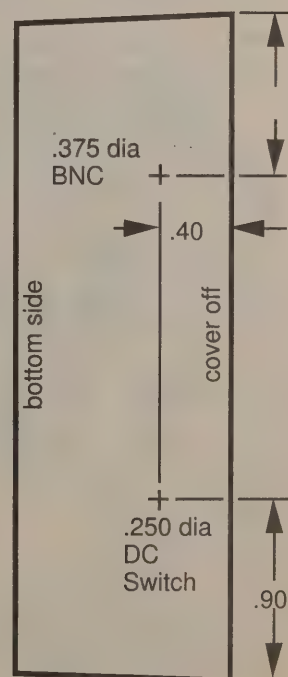
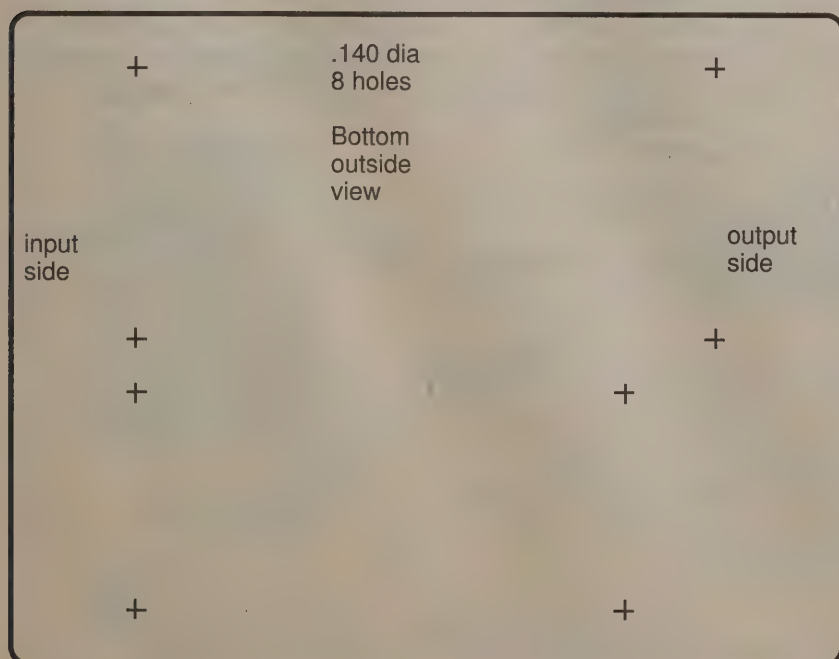
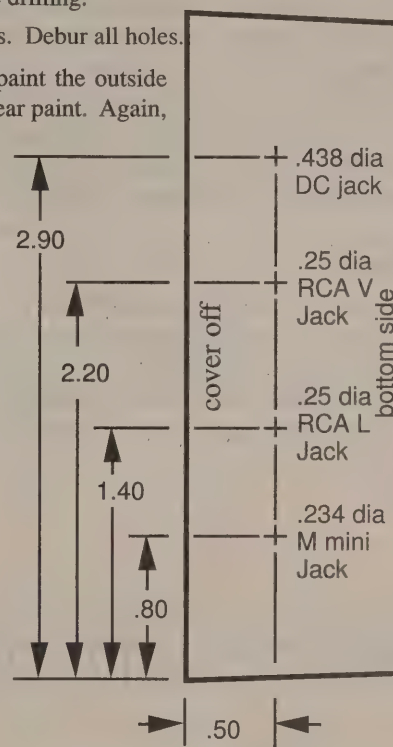
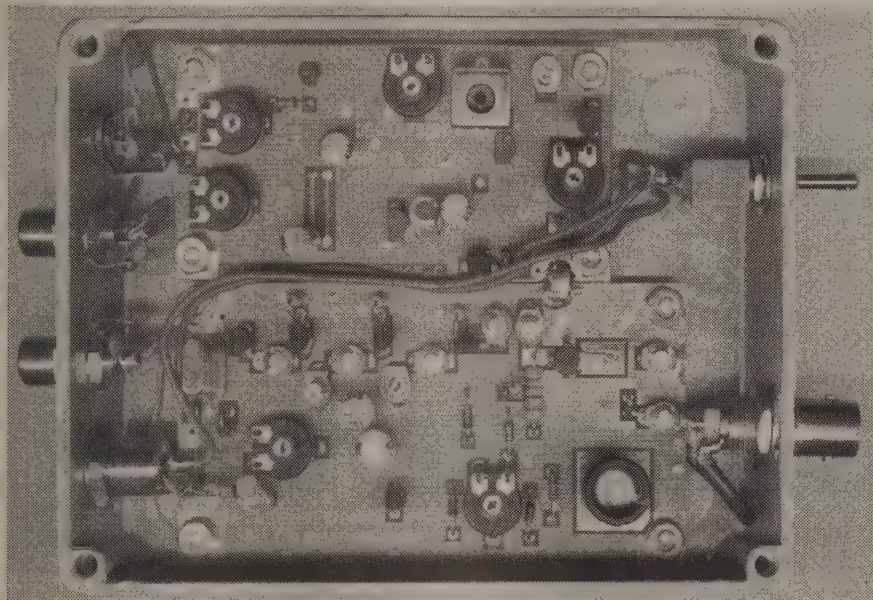
## ELECTRONICS Packaging the 1W ATV Transmitter w/Sound for R/C and Portable Drill Dwg.

Cut out the drill templates, and place over the respective Hammond 1590BB aluminum box sides. Align with the edges and hold in place with tape or a rubber cement. Center punch through the paper, or poke a hole through the paper, then place on the box and mark with a pencil. Measure the distances to the alignment reference holes and correct if necessary before drilling.

Drill all holes with a .140 dia drill first, check alignment again, then finish with the larger drills. Deburr all holes.

Check all parts for fit, then clean the box with isopropyl alcohol prior to painting. Spray paint the outside surfaces of the box and cover. After drying, rub on letters can be applied and then a coat of clear paint. Again, after complete drying, assemble all the parts and wire per the procedure on the previous page.

Dress all the wires and make a solder bridge between the two boards as shown in the photo.





## Payment for Technical Articles

ATVQ will pay for certain articles that it publishes. I will outline the policy here, but it will be subject to change as needed to make sure that ATVQ continues to be an ongoing publication. ATVQ will pay \$25.00 for technical articles that are published and are a minimum of 2 pages. While this is not a great amount, I hope it will encourage more technical type articles to be written. Exceptions will be articles that are written by a manufacturer/seller of equipment that is being written about. While I do not want to discourage this type of article, the article itself is an advertisement of the product. Articles from clubs will be encouraged, and I would expect they would like to share their information with the ATVQ readership. Information gathered from the Internet will not be paid for and is mostly small filler items.

## Ideas

Do you have an idea for an article that you've said to yourself that you wanted to write, but never did. Feel free to check with us to see if it is of interest, or write and send it in. No guarantees that it will get published, but if you don't try, you will never know. I'll be looking to see what you can do!

Preferred method of receiving articles is from **Microsoft Word**, however **Wordperfect** is OK too. Next preference would be **ASCII text**, followed by **typewritten** or **hand written** (clearly). Diagrams or pictures (B&W or Color) can be sent in hard copy, or if you scan them in, save to PCX or JPG formats (actually I can read about anything). If you send a computer disk, make sure it is PC (not MAC) format.

When sending in articles in Microsoft Word, please **SAVE** with **FASTSAVE OFF** and save in Word 6 format. Also, articles written in any word processor, consider what will happen when it is re-formatted to fit the style that I might put it in. An example would be setting up tables or adding figures into the article. They can be very hard to strip out. If possible, put the tables, figures, each in a file by itself. This will help me to be able to import into the magazine format.

Articles can be sent to:

**ATVQ, 5931 Alma Dr., Rockford, IL 61108**

or to our email address: **atvq@hampubs.com**

Also note our web page address: **http://www.hampubs.com**

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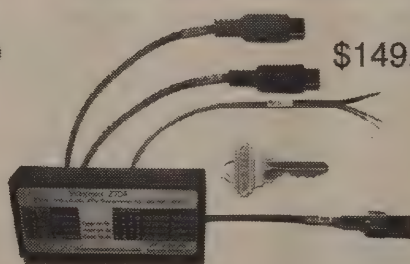


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will contact them.

## ADVERTISERS INDEX

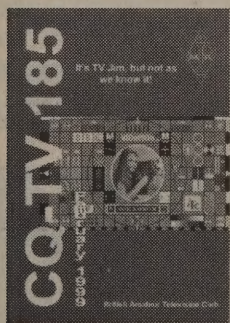
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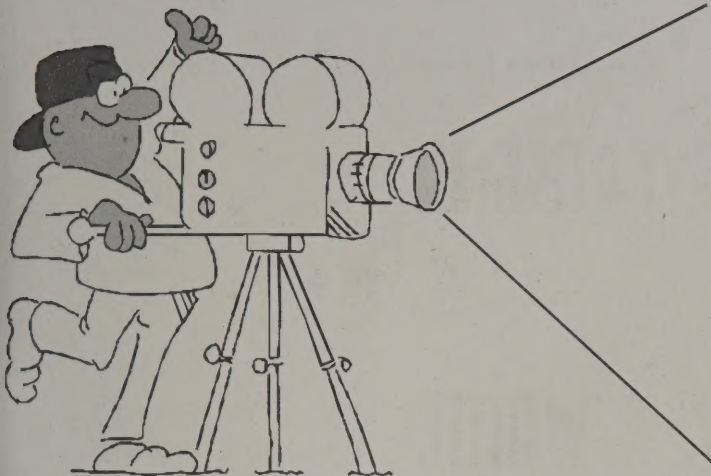


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WINTER	JANUARY 1	JANUARY 15	FEBRUARY 1
SPRING	APRIL 1	APRIL 15	MAY 1
SUMMER	JULY 1	JULY 15	AUGUST 1
FALL	OCTOBER 1	OCTOBER 15	NOVEMBER 1

AD RATES		
Effective November 19, 2004		
INSERTIONS PER YEAR		
SIZE	1-3	4 up
FULL PAGE COLOR	\$650	\$500
FULL PAGE B&W	\$160	\$140
ADDITIONAL COLORS/PAGE	\$100	\$100
1/2 PAGE B&W H or V	\$110	\$80
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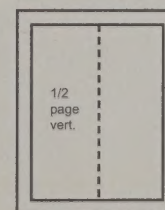
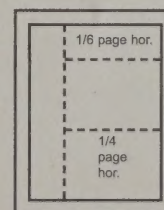
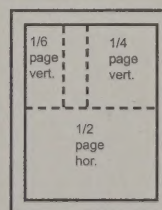
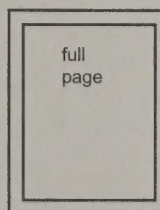
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1/4 PAGE	3 1/2"	5"
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HORIZONTAL	
Width	Height
---	---
7"	5"
5"	3 1/2"
5"	2 1/4"



## Amateur Television Quarterly

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